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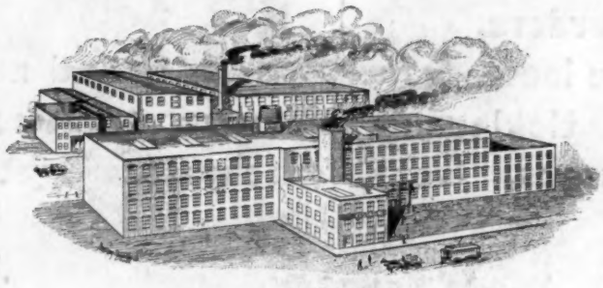

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UNFAVORABLE CONDITIONS IN JAPANESE COTTON MILL INDUSTRY.

One of the most important bankers and manufacturers of Japan, while in this country for the purpose of forming a community of interest with certain powerful New York banks, in conversation with one of the editors of Cotton relative to cotton mill interests in Japan, said that because of extraordinary and special taxation by Japan, European capital has ceased to flow into any of the textile industries of that Empire, and that the statistical position, per unit of population, and gross capital of the Empire, is not so good as it was prior to the war with Russia. That war, while it put Japan before the eyes of the world as a world power, was exceedingly costly, and placed a staggering burden of debt upon all the merchants and manufacturers of the Empire, who have to pay almost five-sevenths of the taxes. This is due to the fact that the great army of imperial office holders, by birth, purchase or appointment, are exempt from taxation, and that the most of the lower classes are so very poor as to own nothing more than the single garment that clothes them.

Throughout Japan, the taxes upon manufacturing enterprises are about five times as much as in the most highly taxed country of Europe. Of the capital attracted from Europe in the past 30 years and invested in textile and other forms of manufactures in mills of Japan, a great deal has been lost through the dishonesty, or the lack of ability by native Japanese left in control of the administration of the business after the European and American expert engineers and mechanicians had been dismissed and all places in the mills filled with native help.

Lack of inventive genius in all fields of art and engineering is a factor against the advance of Japanese industries. Not one good invention or step forward in any industry has come from a Japanese brain since Commodore Perry induced the rules of Japan to make a trade treaty with an occidental nation. All that Japan has done in textiles is to imitate European and American products. By making inferior imitations of products long known in Asiatic markets, and by counterfeiting of the best known American and British cotton goods brands, many dishonorable Japanese cotton mills operators succeeded for a time in getting largely into the markets of China. But these tricks were soon discovered, and there followed in all the markets of China a deep prejudice against Japanese cotton goods that has affected not alone the dishonest Japanese makers, but the highly honorable mill owners of that Empire. These latter deplore the conditions that have brought so many kinds of Japanese made goods into disrepute in Oriental countries that possess almost one-half of the world's population.

Practically, Japanese cottons are barred out of areas of China that have the population of 350,000,000. In those Provinces, the community of interest between Japanese shipping and trading companies had built vast warehouses

for holding cotton goods, and there was maintained therewith the largest and best equipped selling and distributing bodies of men in China. But for a long time these agencies have been closed down or are running at a loss, in the hope that Japanese diplomacy may find a way to bring into being with China a commercial treaty that will put Japanese goods upon as fair a footing as obtains for European and American cotton and other products. But as time goes on it seems to all the enlightened manufacturers of Japan as though China had determined upon a policy of special exclusion of Japanese goods of all kinds and is aiming toward a special commercial treaty with the United States, which the Chinese Dynasty views with especial liking in the belief that the Americans, unlike the Japanese and the several great nations of Europe, have no ulterior designs, as was demonstrated when Japan and Great Britain, France and Germany demanded spheres of influence—in other words, sovereignty within parts of China.

In concluding his conversation, this Japanese banker and manufacturer, said that from recent reports from his agents in Manchuria, it appeared that nine-tenths of the good grade cotton products on sale in that vast and rich Province came from American mills, and that only about one per cent. of the cottons in warehouses were of Japanese make, and those were long in storage by Japanese agencies with whom none of the Chinese buyers would transact business—presumably because of subrosa instructions communicated by the Chinese Viceroy to the guilds of merchants. In another Province, Chi-lih, this Japanese banker reports anti-Japanese feeling running so strongly that no merchant dares to sell anything which came from Japan. In that Province none but American, English and French cotton products are to be found.

A BIT OF PROPHECY CONCERNING COTTON MILLING IN AMERICA.

The world's cotton crop for the current year will amount to about $950,000,000, at points of origin; and at current prices for cotton fabrics, this year's cotton crop converted into products will bring $1,827,000,000 at mills. There exists in the archives of one of the oldest among the cotton spinning families in northern New Jersey, a long letter from a banker of New York addressed to Alexander Hamilton, when he was Secretary of the Treasury. The banker had heard that Hamilton purposed to build a cotton mill at Paterson, N. J. This project the banker condemned, and stated that it was the opinion of all the merchants in New York whom he knew, that not in a hundred years would the cotton milling business in the United States employ 200 persons.

Hamilton went ahead and planned the industrial town that he named Paterson, and also planned and financed a company for developing a water power and for financing corporations threat. Hamilton's original company, known as The Society for Useful Manufactures, exists to this day at Paterson. The agent whom Hamilton sent to England to buy cotton mill machinery was instructed to have it "knocked down," and placed in small boxes that were to be marked "Bibles for the Moravians of Pennsylvania." It was at that time against the laws of England to ship any kind of industrial machinery out of the kingdom. Hamilton's brother and two of his agents were caught trying to ship the cotton mill machinery to Paterson, and they were imprisoned for ten months.

Hamilton, in a speech in 1798, was jeered at by nearly all the men in the Congress for saying that the time would come when the Southern States would make more than enough cotton to supply the home and a large export demand, and that in time the United States would make most of the cotton goods for all other nations.

The attention of Hamilton was first drawn to the matter of manufacturing cotton because of his official correspondence with the British Government about some bags of cotton shipped from Savannah to Liverpool, and there seized by the customs, on the ground that so much cotton —1,800 pounds—could not have been produced in America, and must have been shipped from the British West Indies into Savannah, and thence in an American ship to England. As British colonial freight was not permitted to enter England in other than a British documented vessel, the cotton was seized. That seized cotton was finally sold, through the efforts of Alexander Hamilton, to a mill owner in Lancashire in whose service at the time was Slater, in after time called the "Father of Cotton Milling In New England." Slater, noting the fine grade and long staple of the American cotton, and supposing that it grew near to New England, where he had friends, emigrated there, mainly to induce Americans to help him build a cotton mill.

INDIAN COTTON MILL INDUSTRY.

The first cotton spinning mill was built in 1817 on the banks of the Hoogly, near Calcutta, and it was called the "Bowreah Mills." It passed through several unsuccessful years, and beyond that no record of it seems to be known. The present Bowreah Mills are a successful concern built in the place of the first Indian cotton mill and managed by Kettlewell, Bullen & Co. In 1851 another cotton mill was established at Broach, and in 1854 Bombay received its first cotton spinning mill. Since then the progress in mill building has been rapid, as may be seen from the following statement issued by the Bombay Millowners' Association:

PROGRESS OF INDIAN MILLS DURING THE PAST 33 YEARS.

Year ending 30th June.	Number of Mills.	Number of Spindles.	Number of Looms.	Average Number of Hands employed daily.	Approximate Bales of Cotton Consumed*
1876----	47	1,100,112	9,139	Not stated.	
1880----	56	1,461,590	13,502	44,410	307,631
1885----	87	2,145,646	16,537	67,186	596,749
1890----	137	3,274,196	23,412	102,721	1,008,462
1895----	148	3,809,929	35,338	138,669	1,341,714
1900----	193	4,945,783	40,124	161,189	1,453,352
1905----	197	5,163,486	50,139	195,277	1,879,244
1906----	217	5,279,595	52,668	208,616	2,023,516
1907----	224	5,333,275	58,436	205,696	1,980,170
1908----	241	5,756,020	67,920	221,195	1,991,500
1909----	259	6,053,231	76,898	236,924	2,109,000

*Bales of 392 pounds.

Application of Electric Power at the Columbus Manufacturing Co.

(Contributed exclusively to COTTON.)

BY E. A. WERNER.

THE plant of the Columbus Mfg. Co., Columbus, Ga., presents an interesting illustration of a unit electrical cotton mill drive. The part now in operation consists of two revolving field, two-phase synchronous motors, of 600 and 400 horsepower, both connected by clutches to the same rope sheave. The arrangement is shown in Fig. 1. These machines are built with the field spider cast in one piece and the poles bolted on the periphery. Direct current exciters are used, driven by belt from the main shaft as illustrated; these exciters deliver 75 amperes of current at 125 volts, and a speed of 900 revolutions per minute. The sheave wheel is located between the motors, from which the rope drive to the several floors of the mill is passed.

Two-phase current at 60 cycles and 5,000 volts, furnished from the hydro-electric station of the Columbus Power Co., enters the switchboard directly from the pole lines and without transforming is switched to the motors. For starting the large motors there is provided for each, a 30-horsepower induction motor. These motors are geared to the large motor shaft so that the speed is reduced from 1050 to 225 revolutions per minute, the speed of the large machines. The rope sheave is seven feet in diameter and has 25 grooves for 1¾-inch rope.

The switchboard consists of four marble panels upon which are mounted the necessary recording and indicating instruments. Counting from left to right, panels number one and three are the starting motor panels for the 400 and 600-horsepower motors respectively, and numbers two and four are for controlling the circuits to the large motors. Panel two is for the 400, and panel four for the 600-horsepower. For supplementing the power and relieving the overload on these motors, caused by the addition of more machinery in the mill, there were installed two 75 and one 100-horsepower motors, forming a group drive. To supply these motors with current at 575 volts, the two transformers were installed, each of 150-kilowatt capacity, stepping down the current from 5,000 volts.

For lighting the mill alternating current is used at 125 volts, the circuits being controlled from a single panel upon which is mounted a two-pole switch for each of the four floors of the mill, and one reserve switch for miscellaneous circuits.

The drive outlined furnishes the power for a 30,000-spindle mill and has been in continuous operation for ten years. It was installed, therefore, before the individual and group styles of driving had been thoroughly developed, as the first application of motors directly on the spinning frame was made in 1907 and the first general application of group driving in textile mill was made in 1894. As will be seen by reference to the general plan of the motor rooms in Fig. 2, the building was laid out with the idea of

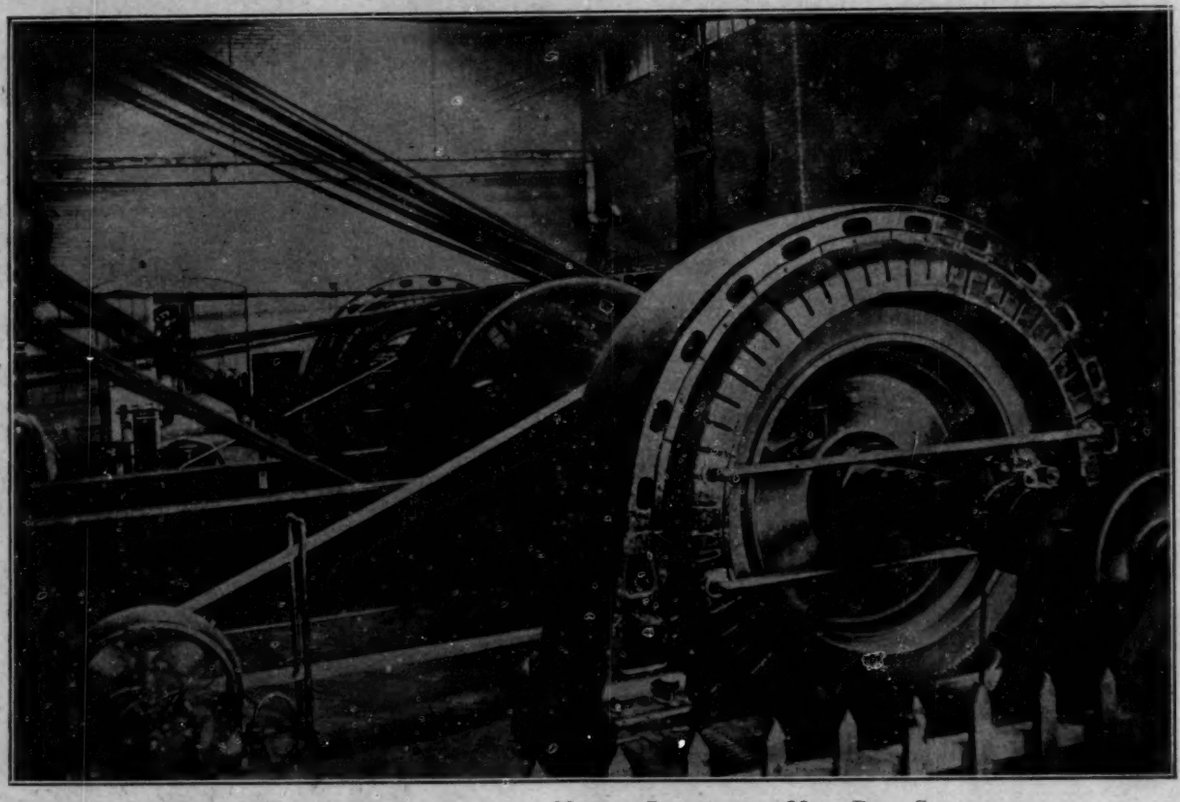


FIG. 1. TWO-PHASE SYNCHRONOUS MOTORS, DRIVING THE MAIN ROPE SHEAVE.

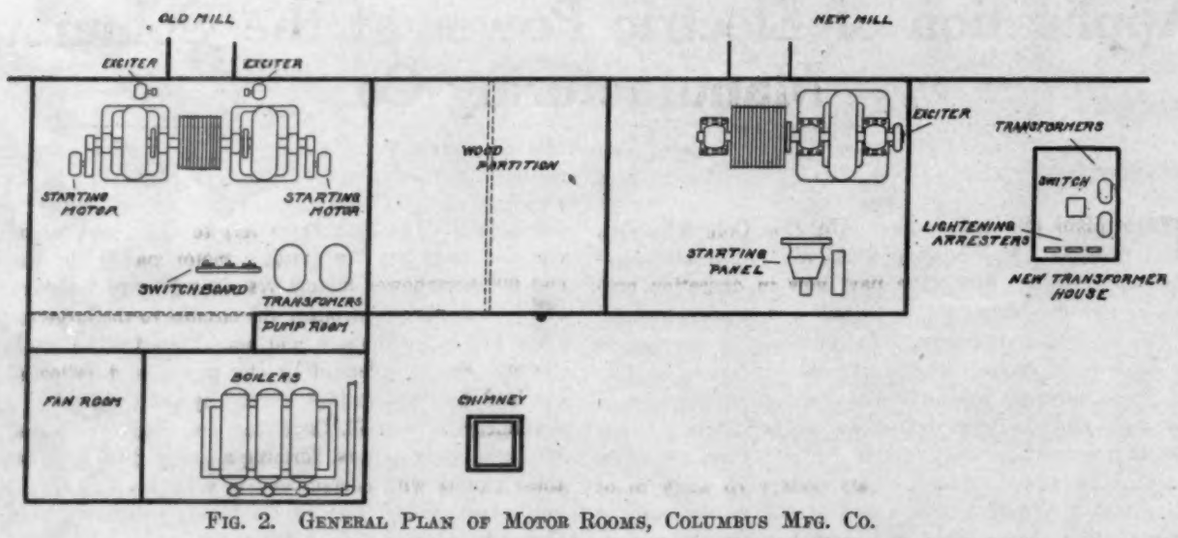


FIG. 2. GENERAL PLAN OF MOTOR ROOMS, COLUMBUS MFG. CO.

substituting a steam engine for the motors, should they not prove as satisfactory as anticipated.

During the past year an addition to the mill has been built, doubling its capacity. As the operation of the unit drive had proven satisfactory to the officers of the company, a new unit of practically the same type was contracted for and set up in a new motor room, which was built as an extension to the old room and in similar relations to the new mill building. This unit is a revolving field synchronous motor of 1,340 horsepower, requiring 267 amperes of current at 2,300 volts, 60 cycles, and a speed of 225 revolutions per minute. For exciting the field there is a direct current generator, the armature of which is mounted on the main shaft and its frame mounted on brackets bolted to the housing. This generator will deliver 128 amperes of current at 125 volts, this feature being an important improvement over the method of exciting employed on the old motors. On the main shaft is also mounted a rope sheave 84 inches in diameter with 33 grooves for 1¾-inch rope. This sheave may be disengaged from the motor by operating a clutch, which is between it and the field spider. From this sheave, nine ropes lead to the main shaft of the first floor, driving a 72-inch sheave at 262 revolutions per minute; seven ropes lead to the second floor and drive a 72-inch sheave at 262 revolutions per minute; and 17 ropes lead to the third floor driving a 72-inch sheave at the same speed.

The starting panel for this unit consists of a single marble panel on which are mounted the indicating instruments. Behind this panel are arranged two starting compensators, the inductive windings of which act for the time being as a step-down transformer and impress a current of reduced potential on the motor until it reaches normal speed. By throwing in the left hand switch, current of approximately one-half the voltage is delivered to the motor which is allowed to continue until full speed is reached, then this switch is opened and the right hand switch closed, which throws full potential on the motor for regular running. The arrangement of the levers is such that the right hand switch can not be closed until the left hand one has been closed and opened, nor can it be closed when the left hand switch is open, so that full current can not be thrown on the motor through error on the part of the operator.

This plan of driving the entire mill machinery by a single large unit is one of three arrangements in use in textile practice, the others being the "group" drive in which a number of machines are connected through a limited amount of shafting to one motor, the layout being so de-

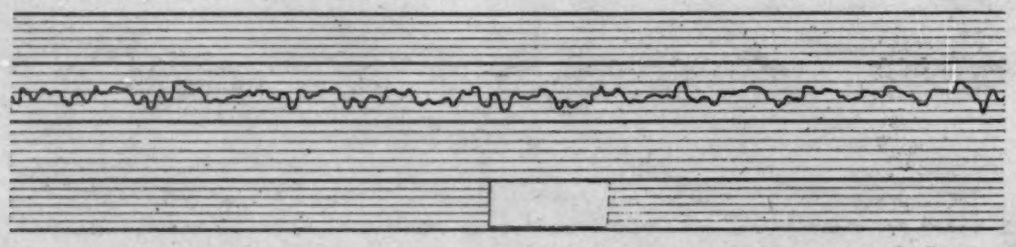


FIG. 3. DIAGRAM SHOWING VARIATION IN SPEED OF A MAIN SHAFT OF A 3,000-HORSEPOWER STEAM ENGINE.

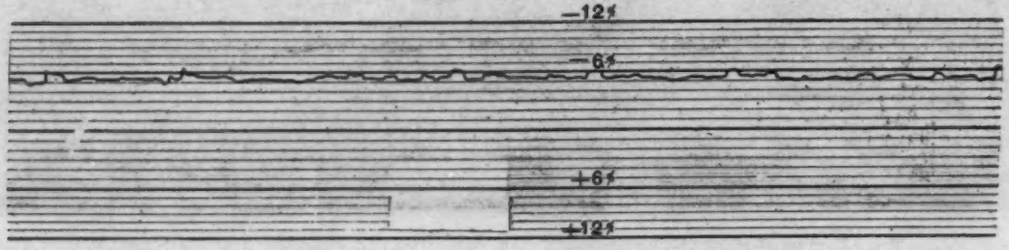


FIG. 4. DIAGRAM SHOWING VARIATION IN SPEED AT ONE END OF A MOTOR DRIVEN 300-FOOT LINE SHAFT.

signed that any group not in use can be shut down without disturbing other operations, and the motors being usually placed in an inverted position on the ceiling of the room. The third method known as the "individual" drive is accomplished by placing a small motor directly on each picker, spinning frame and twister, thus eliminating all line shafting and belting except where motors are placed on the ceiling above the machines which they drive. The units are necessarily small, 5 and 7½-horsepower motors with speeds of 1,200 to 1,800 revolutions per minute, being required and directly connected without gearing to the spinning and twisting frames. Current to each is controlled by a triple pole oil switch connected to the usual shifting rod, the same as used for belt shifting. The control of the motor thus requires no new knowledge on the part of the operator. The speed of the motor is constant so long as the prime mover runs at one speed, which will contribute to a maximum production of high grade cloth.

Assuming that the efficiency of the small motor is four per cent. less than that of 100 horsepower, and allowing for losses by "group" or "unit" driving, the efficiency of this system must be higher than either, although consideration must be given to the necessarily higher upkeep of a large number of small machines. As compared with steam power in an initial outlay, a careful analysis of the itemized costs shows that for a "group" drive arrangement, this cost is 55 per cent. of the cost of a first-class steam engine and its accessories. In the case under consideration the only comparison that can be made against steam is a balancing of the cost of motors and current against a high grade steam plant and the cost of coal.

Where mills have been converted from steam to electric drives an increase in production of from 2 to 10 per cent. has been obtained, brought about by the more constant speeds produced by the direct application of power to the machinery. To show how instantaneous variations which can not be observed by counting, may affect production, a series of cards are reproduced from a paper read at a meeting of the American Institute of Electrical Engineers by Albert Milmow. These were taken with a recording tachometer, the longitudinal lines representing one per cent. of instantaneous variation and about one-half inch in length representing one second in time. Fig. 3 shows the variation of speed of the main shaft of a 3,000-horsepower steam engine, while Fig. 4 shows the variation in speed at one end of a 300-foot line shaft and Fig. 5 the variation at the other end, showing that where the original speed was excellent, it was badly perturbed before reaching the end of the shaft. Thus it can be realized that with varying speed on the main shaft of the prime mover itself, a most undesirable variation exists in the long lines of shafting. Fig. 6 is a good illustration of the speed variation of an 85-horsepower motor.

Fig. 7 is an actual record from an engine driven shafting in a mill showing how bad the variation may be. On account of it this mill was not able to turn out a good production, as the highest point in the diagram shows the maximum speed at which the work will run, and all below that point represent a loss of production.

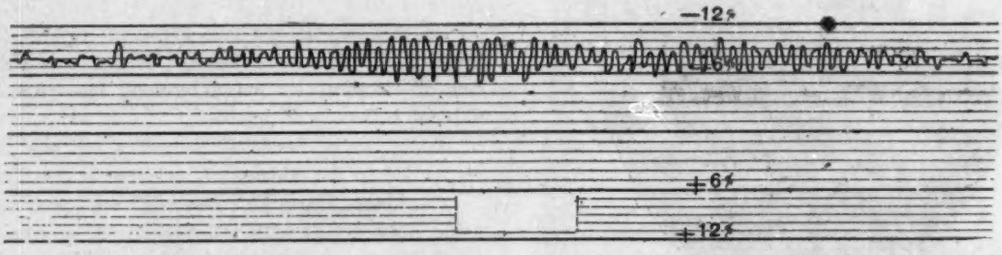


FIG. 5. DIAGRAM SHOWING VARIATION IN SPEED AT THE OTHER END OF THE 300-FOOT LINE SHAFT.

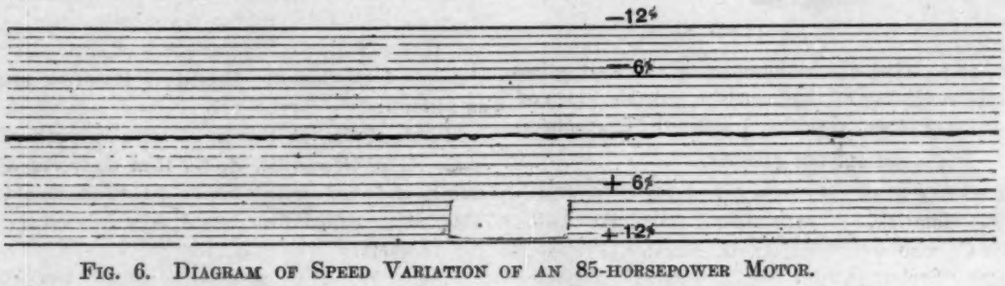


FIG. 6. DIAGRAM OF SPEED VARIATION OF AN 85-HORSEPOWER MOTOR.

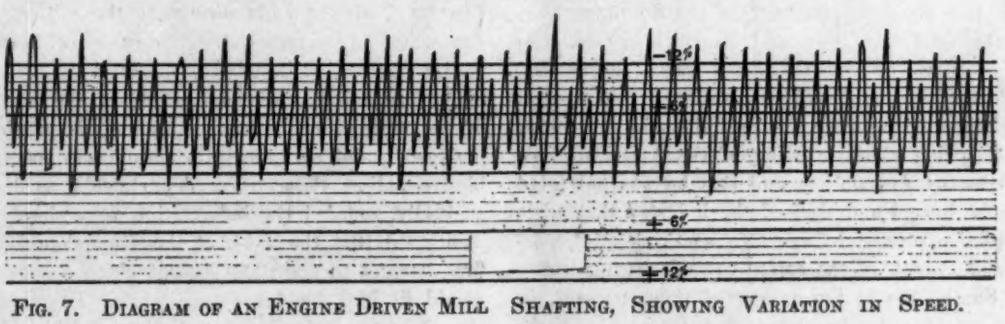


FIG. 7. DIAGRAM OF AN ENGINE DRIVEN MILL SHAFTING, SHOWING VARIATION IN SPEED.

Southern Textile Association Meeting.

The Fall meeting of the Southern Textile Association was held on Saturday, November 26, in Charlotte, N. C., the three sessions being held in the assembly hall of the Selwyn Hotel. Between 250 and 300 members and guests were present at the convention, and the meetings were marked by a practically full attendance.

The Greater Charlotte Club, with offices on the first floor of the Selwyn Hotel, donated the use of its room to the Association for registration purposes, and from early morning until the afternoon, there was a steady stream of members registering and applicants for membership enrolled. For a couple of hours before the time for the opening of the meeting, the members gathered in the lobby of the Hotel Selwyn, renewing acquaintances and meeting

PRESIDENT W. P. HAMRICK.

the new members. One of the features of the convention was the sincere cordiality of the members and the desire of those in attendance to get acquainted with all the members.

THE MORNING SESSION.

The first session was called to order at 11:30 by President W. P. Hamrick, superintendent, Olympia Mills, Columbia, S. C., who introduced C. O. Kuester, President of the Greater Charlotte Club. Mr. Kuester reviewed the organization and rapid development of the Southern Textile Association and then presented Mayor Hawkins, who delivered the address of welcome to the City. In his very pleasing address, Mayor Hawkins mentioned that it had been his privilege to welcome the capitalists in the cotton industry last spring at the meeting of the American Cotton Manufacturers' Association, and that he was now glad to welcome the brains and skill of the industry that serve to make capital a potential force. In speaking of the development and growth of the cotton manufacturing industry in the South, due to the energy of those present, he regretted the fact that the unbounded forests in North Carolina with their untold wealth have not had the same forces to develop them in a similar manner to the cotton manufacturing industry which is proving such a prosperous enterprise in the South today.

M. G. STONE, Chairman of the Board.

Mayor Hawkins stated further that when agriculture was the chief industry of the State of North Carolina, there was not a city of any size in the entire State, but with the advent of cotton manufacturing within its borders, the State had become studded with large and prosperous cities, which meant not only prosperity to residents of the cities, but added its quota of prosperity to the entire country.

In speaking of the recent federal tax on the corporations, Mayor Hawkins declared that it was placing a burden of taxation on manufacturing enterprises, which he did not believe was justified.

J. M. Davis, Supt. of Newberry (S. C.) Cotton Mills, responded to the address of welcome.

President Hamrick then delivered an address, prefacing his remarks with a few words of appreciation of the honor bestowed upon him in electing him president of the Association, stating that the election had been made in Augusta last July, during his absence, owing to illness, and this was his first opportunity of expressing his appreciation of the honor. President Hamrick spoke in part as follows:

L. P. Hollis, in charge of welfare work of the Monaghan Mills, Greenville, S. C., then delivered a most interesting and instructive paper on "Industrial Education." This paper called forth some very interesting views from the members.

John W. Fox, representative of the Westinghouse Electric & Mfg. Co., in discussing the subject, stated that education and industrial training were becoming very potent factors in the cotton industry. He stated that heretofore textile men had grown up in one department of the mill without learning the details of the other departments, and that the information was not very accessible regarding these other departments as the overseers generally guarded the information very closely. Mr. Fox mentioned that the work at the Monaghan Mills was the first attempt to train the student along a specific line that would fit him for his future work. In other words the schooling lays emphasis on the work which has a direct

bearing on the textile industry. He mentioned that the Woodside Mills, while doing an excellent work was inaugurating a school system along general lines which he thought would not be as productive of as good results, on account of the fact that the scholar is taught mathematics, etc., but is unable to apply them to mill calculations. He stated further that this inability to apply knowledge was a great hindrance to many men of even high education who understand the principles of algebra, trigonometry, etc., but are unable to work out some of the simple calculations in textile machinery. He suggested that the school committee of the Woodside Mill would do well to formulate a curriculum that would embrace studies with special reference to the textile mill.

R. J. Smith, of Henrietta Mills, Henrietta, N. C., asked Mr. Hollis the kind of text-books used, as his idea was to begin in a small way at his mills. Mr. Hollis mentioned that the teaching devolved principally upon the instructor, each one being chosen with special reference to his department, and that ordinary text-books as found in the common schools were used. The instructor plans the work with a view to applying the knowledge to textile manufacturing.

E. C. Gwaltney, Supt. Fairfield Cotton Mills, Winnsboro, S. C., then delivered a paper on "Size and Size Mixing," which was given very careful attention by the members. On account of the lateness of the hour, it was impossible to devote any time to the discussion of the paper. The session adjourned to have the convention photograph taken and meet again at 2:30.

AFTERNOON SESSION.

The second session of the convention was called to order at 3:00 o'clock and William P. Bear, of the Westinghouse Electric & Mfg. Co., delivered a paper on "The Care and Operation of Electrical Apparatus in Textile Mills."

R. L. Biggs, Rockingham, N. C., then delivered a paper on "The Card Room."

In the absence of T. B. Wallace, Supt. Watts Mills, Laurens, S. C., W. P. Hurt, overseer of carding at the Locke Mill, Concord, N. C., opened the discussion on "Card Setting." Mr. Hurt spoke in part as follows:

This term when applied to the setting parts of the revolving flat carding engine must be determined by the length and quality of the staple and the weight of lap.

(1) THE FEED PLATE TO THE LICKERIN. There is more difference of opinions in setting at this point than any other in the card. As a grinder 25 years ago I was taught to set this point to 7/1000. Now I would not set to 7/1000 unless I had very short staple and a light lap.

With cotton 1 inch to 1⅛ inches set to 9/1000
With cotton 1⅛ inches to 1 3/6 inches set to 11/1000
With cotton 1 3/16 inches to 1¼ inches set to 12/1000
With cotton 1¼ inches to 1½ inches set to 14/1000.
With cotton 1½ inches to 1¾ inches set to 16/1000

Where combers are used, it is very easy to see what close setting at this point does for the staple. While using a 1¼-inch staple and a 12-oz. lap with feed plate, set to 12/1000 carding to make 40s yarn, the breaking strength was 50 to 53, (Draper's new standard is 48). We set two cards to 7/1000 at the feed plate, kept track of the samples to the spinning room and found the breaking strength to be 45 to 47, from the same lap. We then turned the product through the ribbon lap machine, and to the comber and found nearly one per cent. more short staple being taken out with a setting of 7/1000 than with a 12/1000. Following the sliver from this point to the spinning we tested the yarn and found it to break at 63 to 65, with both settings. This leads us to see that short staple depreciates the breaking strength of yarn.

(2) Set lickerin to cylinder, 7/1000.

(3) Flats to cylinder. Set the front to 9/1000, gradually increasing to 12/1000 at the back. The reason for setting closer at the front than the back is that as the flats become full of strippings they should run closer to the cylinder to do their work properly.

(4) Set doffer to cylinder, 7/1000 tight.

(5) Set comb to doffer, 12/1000.

(6) Set stripper plate to cylinder, 34/1000 and closer for coarse work.

(7) Set screen to cylinder, 34/1000, seeing that the center comes to a joint also to the Lickerin screen.

(8) Mote knives and lickerin screen to lickerin. Set this point with a disk on a shaft, move the disk with the

W. P. HURT.

gauges and set the knives to 12/1000 and the screen to 14/1000. See that it makes a close joint to the cylinder screen and is 24/1000 from the cylinder.

(9) Set the flat comb to flats, 12/1000.

(10) Brush to flats should not be set deeper than the length of the wire. If set deeper than necessary, it will fill the flats with short staple and give trouble.

John W. Fox, in continuing the discussion, asked to have the question answered as to the correct speed of the beater on the picker, both for the two-blade beater and the three-balde beater. In discussing Mr. Biggs' paper on the "Card Room," Mr. Fox stated that he had made experiments with driving drawing frames from above and from below, and that he was convinced that it takes twice as much power to drive from below as from the top. He was very much interested in the speed of beaters and asked for some one to answer his question.

Ralph Webber, with A. H. Washburn, Atlanta, Ga., in discussing card setting, stated that he had often heard of carders setting at different points to a tight gauge and to a loose gauge, and he wanted to know just what is meant by these two terms. He mentioned that in using a No. 7 gauge, sometimes a No. 10 gauge can be inserted and at others a No. 5 gauge cannot be inserted, and he supposed that the first had been set to a No. 7 gauge loose and the other to a No. 7 gauge tight. He suggested the use of three gauges in making a setting, that is, set the card with the desired gauge and then test the setting

with a larger and a smaller gauge to ascertain just what the setting is. Mr. Webber mentioned that practically no two carders used the same setting or the same setting points, as the carder has to meet the different conditions of his room. Even different cards in the same room will have to be set differently in order to make up for some defect or irregularity in the card.

Marshall Dilling, Supt. Avon Mills, Gastonia, N. C., stated that he had been experimenting with the speed of beaters for practically 18 months and he thought after another 18 months of experimenting he might be able to give some definite figures.

W. P. Hurt, in discussing the speed of beaters, stated that at 1400 revolutions a minute, he had encountered split laps. After reducing the speed to 1236 revolutions per minute, there was less splitting of laps, but there was still sufficient to give trouble in the mill. By increasing the diameter of the fan pulley from 7 inches to 9 inches, he had succeeded in entirely eliminating split laps from the process, and the work with 1236 R. P. M. of the beater was entirely satisfactory.

M. G. Stone, General Supt. of the Pacolet Mills, Spartanburg, S. C., stated that there was no standard speed for beaters, as the different carders ran the beaters at different speeds according to special conditions. He mentioned that the old Whitin lapper beater ran at 2,000 R. P. M., and that he had seen some beaters running as low as 1200 R. P. M. Now as a rule manufacturers recommend 1500 R. P. M.

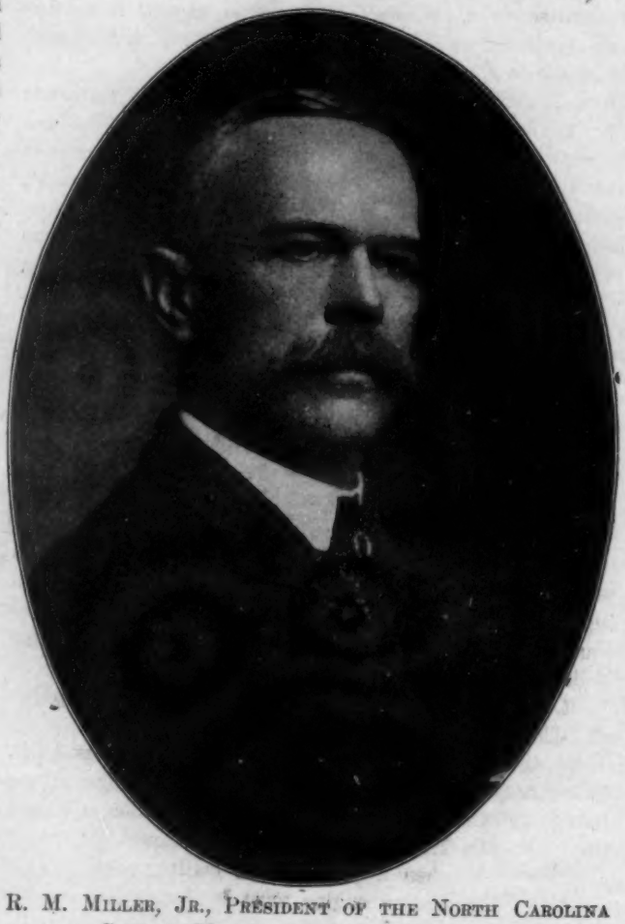
A. N. Landau, with A. H. Washburn, Charlotte, N. C., in further discussing the subject of card setting, stated that the settings depended altogether on the requirements of the product. In other words, the settings for a card which was to produce material for carpet yarns would be set differently from a card making stock for print cloth yarns. In regard to the mote knives, he stated that the front knife should be set a little farther off than the second knife, in order to have the action of the knives on the extraneous matter gradual. He also stated that it was better to get a little fly in with the dirt and hulls under the mote knives, in order to be assured that the heavy impurities were extracted at that place.

Fred White, of Whitted & White, Charlotte, N. C., stated that the South was not behind in the matter of education as had been stated, and that the class of help was much superior to that in the North which consisted in a great measure of foreigners. He stated that the South has men of brains in the mills, and that the future of the industry in the South was sure to be successful on that account.

The President then announced that he was ready to give attention to any business that might come before the convention. W. M. Sherrard, Supt. Jackson Mills, Iva, S. C., then read a telegram from the Mayor of Anderson, S. C., inviting the Association to hold its July meeting in that city. The invitation was indorsed by the Anderson Chamber of Commerce. On motion, the invitation was accepted, and the next meeting will therefore be held on Saturday, July 8th, 1911. T. H. McCall, Greenville, S. C., then proposed a resolution that the program committee be continued. The motion was carried. The local committee on entertainment in Anderson, was proposed as follows: J. A. Lyons, A. P. Hurt, F. D. Williams, C. W. Causey, and T. H. Henderson. Secretary Escott announced that the entertainment committee had invited the Association as a body to a special matinee at the Alamo Theatre, and asked that the members assemble at the theatre at five o'clock. The meeting then adjourned to meet again at 8:00 o'clock.

EVENING SESSION.

The third and last session of the convention consisted of a smoker and addresses by R. M. Miller, Jr., president of the North Carolina Manufacturers' Association, Charlotte, N. C., and W. A. G. Clark, representative of the United States Department of Commerce and Labor.



R. M. MILLER, JR., PRESIDENT OF THE NORTH CAROLINA COTTON MANUFACTURERS' ASSOCIATION.

R. M. Miller, Jr., Charlotte, N. C., then presented an interesting address on "The Relation of the Managing and Operating Departments of a Cotton Mill." Mr. Miller took occasion to express his approval of the work of the Association by congratulating it upon the progress made in so short a time, and stated that every one could learn something by contact with men in similar lines. The meetings and discussions widened and broadened the scope and vision of the members. To illustrate the benefits derived from association meetings, Mr. Miller made a personal allusion and stated that as a manufacturer of cotton yarns, some years ago, he was perfectly familiar in making yarns up to No. 40s, but above that it was simply an experiment with him. He was one of the pioneer spinners of fine yarns in the South, and had no one near at hand whom he could consult in regard to the spinning of these yarns. At that time he was a member of the New England

Cotton Manufacturers' Association and attended its meetings. At one of these meetings he asked assistance from members of that association, who had had experience in fine yarns spinning, and he was greatly benefited by the advice and information received. In fact, Mr. Miller stated that the advice given at that time was worth more than all of the dues he had ever paid into the association or ever would pay.

In discussing the relation of the managing and operating departments of a cotton mill, he stated that this relationship must be harmonious with free consultation between the heads of the managing department and the operating department or there could be no success in the mill. The efficiency of a mill must consist of the combined efficiency of both of these departments in order that the mill may be prosperous. If production falls off, quality depreciates, there can be no success for that mill, regardless of the efficiency of the selling end, and vice versa. Under the head of the managing department, Mr. Miller placed the buyer, seller and financial agent; and under the operating department, the superintendent and overseers. That each department has its own province was illustrated by a mill where the directors met every Monday morning to lay out the policy of the mill for the week. The directors, however, were not practical mill men. The superintendent was called in and given instructions as to how to run the mill. The result was that the mill has since gone into the hands of a receiver, which of course, meant failure for the scheme of operating the mill.

Mr. Miller said that as manager of the mill, he consulted with his superintendent every day when he was at the mill, always keeping in close touch with the superintendent and discussing matters pertaining to the operation of the mill. While they may differ sometimes, yet by means of a conference the best method is arrived at and in case of disagreement, the manager has the final word as he is the one responsible to the stockholders for the prosperity of the mill.

In engaging a superintendent for a mill, Mr. Miller said that while knowledge and information on cotton milling play an important part, he first inquires if the applicant is a sober man. He stated that no superintendent or manager can be successful if he is intemperate, regardless of his ability. Lack of harmony, he said, generally comes from the manager who does not confide in the superintendent. Any information that he can give the superintendent, is always cheerfully given, and he never hesitates to tell his superintendent what he is paying for cotton or what price he is getting for his yarns, in case the latter cares to know. Without this harmony and daily contact, between the manager and superintendent, it is impossible for a mill to be successfully operated for any length of time.

W. A. G. Clark then delivered a very interesting paper on "Cotton Manufacturing in Latin America." In prefacing his remarks, Mr. Clark stated that the Southern manufacturers should make an effort to secure more of the trade in Latin America, as the same amounts to only thirty million dollars of American goods out of one billion dollars of imported goods in a year. England obtains 360 million dollars of this trade every year. He stated that one reason was that the mills in the South are not familiar with the needs of this trade and others who do know of them won't meet the requirements. He stated that the mills in the United States were clearly producing more than this country can consume and that foreign markets must be secured in order that success of Southern textile enterprises shall continue.

All of the addresses delivered before the Association are printed in this issue.

Short talks were then made by A. H. Washburn, Charlotte, N. C., C. B. Bryant, Sec'y. American Cotton Manufacturers' Association and president of the Southern Manufacturers' Club, and C. C. Moore. On motion, Geo. S. Simpson and Henry W. Atkinson were added to the program committee.

W. P. Hurt proposed a resolution of thanks to the textile manufacturers and others of Charlotte who had been responsible for the very pleasant meeting in that city. The motion was carried by a rising vote. G. S. Escott, Editor, *Mill News*, proposed a vote of thanks to the stenographer, Miss Minnie G. Cranford. Refreshments were served and the convention brought to a close at 11:00 o'clock.

INDUSTRIAL EDUCATION.

BY L. P. HOLLIS, GREENVILLE, S. C.

This subject will be confined to textile studies for mill men and boys. You are practical men, and I know no theories to present to you, if you wanted them. The subject will be approached from the standpoint of the mill operatives.

If the South is to continue to forge to the front in the manufacture of cotton, more skilled and intelligent labor must be developed in our midst. There was a time when we drew on New England for help, but that day has passed. Now we are entering into active competition with New England in the manufacture of cotton goods, and they have no more men to send us. The mills need trained workers, men possessing the comprehensive insight, interest and skill necessary for the organization and direction of a plant. Such men, whether workers, foremen or superintendents, are now usually developed by chance; and they are then self-made men, possessing all the merits and also the conspicuous demerits of their training. Managers everywhere say that they prefer men who have worked their way up in the mill, provided they have the proper knowledge of technical work. They are the logical ones to rise. The men who are ahead today have gotten there by hard licks. Many of them have, by themselves, dug out the hard problems and have mastered the situation. Others have put their money into correspondence courses, and with all their might they have worked with the teacher away off somewhere else, until they have learned about the mill. Such men deserve great credit.

There never was a time when there was such a great demand for the man who can work and think at the same time as there is today. Realizing this demand, and in order to meet it, five textile schools have been established in the South, drawing their students from the farms and cities. They are all splendidly equipped and well prepared to do good work.

Now it is argued that the mill is school enough within

itself, and no one will deny that it is a good school. No other one thing has done so much for the poor white people of the South as has the cotton mills. In turn they have filled the mills with the very best and cheapest labor that could be had. The mills have brought the people from isolated farms to up-to-date villages. The man who was a renter working for some one else, and never seeing a real dollar, now becomes a money maker on regular wages. If he is ambitious, he is rewarded by advance in position and salary. He and his family are taught the lesson of industry, thrift and honesty. In addition, he has better school, church and social facilities. From being a slave to the land owner and merchant, he becomes an independent man with a good trade.

And while it is true that the mill is a fine school, yet this education in the mill needs to be supplemented by well adapted instruction in schools. Although the youths of the mills have not been able to attend our present textile schools, yet they have been in need of supplemental textile education, and have beeen desirous of getting it. This is seen by the manner in which some of them have worked. I propose to give two practical methods by which this education may be received, by those already at work in the mills, namely, night schools, conducted through the

L. P. HOLLIS, IN CHARGE OF WELFARE WORK, MONAGHAN MILLS, GREENVILLE, S. C.

co-operation of the management and operatives for their mutual benefit, and by night schools supported from State funds and under State supervision.

The dominant motive in such schools must be vocational training, rather than general culture, as with the present public schools. Not that general culture is to be discounted, but this is not the place for it. Oftentimes a grown man or a married man will apply for instruction, and he is at the age when he wants something practical and to the point. It is important that this distinction be kept in mind, as the dominant motive of a school will largely decide its efficiency. The first obstacle met in any textile work in the mill is the lack of foundational training. So the facts must be faced as they are, and the school must necessarily begin with simple studies and individual instruction be given.

Now, as to my first proposition: The work in connection with the Monaghan Mills' Young Men's Christian Association is so close an approximation of my ideas about a night school, that I am going to risk being too personal in order that I may give a practical idea about what I mean. In doing this, I do not want to be understood that we have a perfect system. Perhaps I see more of its shortcomings than any one else. We take any man or boy above fourteen years of age; it makes no difference whether he knows his letters or not, and we have a class to fill his need. The following is an outline of the courses offered by the association:

Group courses for boys: Reading, writing, arithmetic, letter-writing, compositions, and free hand drawing.

ARITHMETIC: Fundamental process in arithmetic, definintons, addition, subtraction, multiplication, division, factors, multiples, cancellation, fractions, decimals, percentage, interest, ratio, proportion and square root. This course is finished in one year.

ENGLISH. Fundamental parts of speech, exercises in parsing sentences, spelling, capitalization, punctuation, exercises in letter writing and compositions, ability to express one's self clearly and accurately.

MILL CALCULATIONS: Calculations on speeds, drafts, twists, and productions, measuring motions, etc., various yarn calculations, cloth calculations and lay-outs.

MECHANICAL DRAWING: General principles of drawing, lettering of working drawings and reproduction of plates, use of instruments, sketching actual parts of actual machinery and reproduction from these sketches of accurate scale drawings.

TEXTILE DESIGNING: Terms used in designing, design paper, and its uses. The methods of representing weave drafts on design paper. Explanation of harness and plain drafts. Calculations for single and ply yarns; cloth calculations and reproduction of fabrics.

This instruction is done without the aid of machinery, as the men know the practical side of the mill already. The idea is to add such machinery as will be needed from time to time. In addition to the above courses, there is a splendid library, a progressive literary society, and a lecture course. From time to time, practical talks are given by practical men on various textile subjects. No time is taken from the mill for this work, as all of it is done at night. A course on electricity will be offered after the holidays. At the end of the term, examinations are held, and those who pass with satisfactory percentage are given certificates.

The teacher is the key to the success of a night school, as in any school. He need not be highly educated, but he must know more than the students, and above all, he must have the best interests of the students at heart. Given the right teacher, and there is no trouble to run a night school.

The second plan that I have to present is that the State should take a part in the training of our mill people. A new situation has suddenly developed, and our public schools are inadequate to meet the needs of our people. Surely here is a task worthy of the efforts of some good man. A great deal of attention is being paid to our rural and city schools, and I am glad of it, and now the time

has come for work and attention to be focused on our mill schools, to make them efficient. Nowhere is the need for compulsory education felt more keenly than in our mill districts. The mill schools should be made more practical and efficient. As a rule, they have been taught by women who could secure positions nowhere else, and oftentimes the school rooms have been overcrowded and unsanitary. I asked the Greenville County superintendent of education the other day, whether the mill schools were classed as rural or city schools, and he said that he supposed they would be classed as rural schools. Agriculture is being taught in all the rural schools of Greenville County, and is required in all the mill schools. Why not teach textile subjects in the country schools?

Such schools would send out into the mills, youths fully equipped to meet the exigencies of modern life. They would be good citizens as well as good workmen, for they would understand the significance of all that they did, as well as its profits to themselves. The consciousness of resources would render them progressively responsible and efficient workers in the mill, and equally progressive and responsible members of society. All that the mill workers need is an opportunity. Give it to them, and they will not only teach the world how to make cloth, but they will give the world lessons in honesty, sobriety and uprightness.

President's Address.

There is nothing so advantageous to those of us associated in a common line of work, to the individual and to the industry as well, as semi-business associations, where the members of such have time and opportunity for full and free social intercourse at certain specified periods. Such meetings, you will find, make friends, relieve embarrassments, break down prejudices, and, for the time at least, put us all on a common plane, so that we get out of our old line of thought, to our social, mental, and industrial advantage. We lay aside all cares, throw business to the wind, and enjoy that side of our nature which distinguishes us from other beings. We look forward to both the discussion of problems and to the social enjoyment with pleasure, for weeks beforehand, and live the good times over again for many weeks after. No man can "grind" continuously without wearing out. He must "oil" up occasionally and these meetings relieve the grind by lubricating our "mental bearings" and make us more efficient in all respects. They stimulate in us the spirit of rivalry to our mutual benefit. It goes without saying that the discussions on the floor of such meetings cannot but help the individual, if he takes in and retains what he hears.

The Association should stimulate its members to broaden themselves along all lines, but, as many of us are considerably hampered by lack of educational advantages, it should lay special stress upon the broadening out of its members along the line of industry in which they are employed. You so often hear a superintendent or an overseer say: "I am a Carder," or, "I am a Weaver," tacitly admitting that he is short on the other departments of the mill, while he should be, and can be well posted about every department with which he is associated. They should be stimulated to prepare themselves for bigger places in the world than the positions they now hold. To do this, they should be encouraged to prepare themselves to take part in the preparation and reading of papers, and in the discussion on the floor; to discuss the conditions in general surrounding their special industry; to prepare themselves so that instead of always working under instructions that they will be called into consultation with others, and thereby put the result of their observation into practice. They will be bigger and broader men, sought after and secured, not to only their own benefit, but to the benefit of the industry in which they are employed, and the community as well.

SIZE AND SIZE MIXING.

BY E. C. GWALTNEY, SUPERINTENDENT FAIRFIELD COTTON MILLS, WINNSBORO, S. C.

Having had to take charge of a mill, knowing absolutely nothing of the size mixer's art, and working in the dark trying everybody's make of size, I suppose I have purchased my experience as dearly as any one present. For sometime I had an idea that size was akin to witchcraft and magic, for any number of salesmen would come along with a magic gum or compound, of which only a pound or so put into a kettle of size would increase my weaving production from 5 to 10 per cent. and reduce my seconds to a mere bagatelle. I impartially tried them all —so you can imagine the condition of my weave room at the end of a year.

Before entering the mill business I acquired a fair knowledge of chemistry, so I decided to see what I could make out of this question, upon which no two men seem to agree. First, I resolved to use nothing in my size kettle, the nature and effect of which I did not fully understand, and to mix my size with a definite end in view instead of the haphazard way to which I was accustomed. My first attempt was with a mixing in which I employed only the two ingredients, starch and tallow, and I found this gave as good a result as the mixture in which I had used the compound. This was the beginning of my study of the subject, the results of which I will now give.

In the earliest history of cotton weaving, it was found that by spreading a paste made up of flour and water on the warp yarns, the weaving was greatly improved. Later, with the advent of the power loom, the demand arose for greater strength and elasticity in the warp. It was then found that the addition of tallow or other oils to the size gave the necessary pliability to the yarns. This gave results that were perfectly satisfactory to the art at this time. However, as the improvement in the art of weaving continued, the demand for increased strength, elasticity, and pliability arose; and the latest improvement, namely, the automatic loom, makes the decided demand on the size mixers ability. Work that hitherto gave perfect satisfaction on the plain loom, when put behind the automatic loom developed defects in our warps not previously recognized. It is to meet this present condition that the size mixer must exert his best effort to keep up with the pace set by the modern speeds, etc.

I will now endeavor to name and describe the more common materials used in pure sizing only, as sizing for weight in this country is not practised to any great extent.

SIZING INGREDIENTS.

First in order of importance are the starches. Starch is a white glistening powder composed of about 95 per cent. granulose and 5 per cent. cellulose. Viewed under the

microscope, each kind of starch has its own characteristic appearance and can be readily distinguished by the form and size of its grains. The starch granulose which is, by far, the greatest part and most valuable to the size mixer, is covered by a thin coating of cellulose. This cellulose being practically the same substance as cotton and wood fiber, has no value to the size maker. The starch grain when unbroken is insoluble in cold water. Although water can pass through the coating of cellulose to the granulose in the interior of the grain, none of this substance is able to pass through the shell until it is broken. It is to the variation in character and thickness of this outer shell of cellulose that the different results obtained from starches are due. When starch is heated in water to a temperature varying from 149 degrees for potato, to 176 degrees for corn starch, the starch granules are broken and the mixture gelatinizes. It is very important when boiling the starch to remember that owing to the stiffness of the paste formed and the poor circulation of heat in the size kettle it is difficult to burst all the starch grains, and those that are not broken are of little value to the mixing, being more than liable to be beaten off during the process of weaving.

When starch is treated with a cold solution of caustic soda or caustic potash, the outer coating of the grain is dissolved and the starch is rendered soluble in water. Starch paste so made does not lose any of its tenacity on being boiled. A number of sizing compounds are based on this action of caustic soda on starch. Dilute acids have the effect of converting starch into dextrin and glucose or grape sugar and starch so treated (the thin boiling kind), loses in strength, for its chief value to the size mixer is its ability to form a paste. The above substances, while valuable to the finisher, have no place in the size kettle.

PROPERTIES OF STARCH.

A few words now as to the properties of the various starches. First comes flour, a mixture containing starch and other substances, the most important of which are gluten, albumen, sugar and dextrin. It is rarely used in this country for size mixing, being much higher in price process of fermentation before becoming fit for use in size. It is almost exclusively used in England for the heavy sizing practice there, as it has the property of fixing the China clay on the yarn to a greater extent than any of the other starches.

Second in order comes potato starch. This starch when of good quality and not adulterated with corn and other starches is a most valuable one to the size mixer on light and high pick goods, though all starch sold as potato starch should be given a rigid investigation under the microscope before it is purchased. Potato starch has one defect though, namely, that of growing thinner on repeated boiling. A mixing left over Sunday, on boiling up Monday is likely to make soft warps and thus cause trouble in the weave room. This can be remedied to a great extent by adding a small amount of caustic soda to each kettle of size.

Third in order, and most important to us, comes corn starch. This is the starch with which we are most familiar, in the various fancy named starches as well as the older brands, "Pearl Big N," etc. In fact, I have examined starches sold under various trade names, and in no case have I found any starch other than corn in the sample obtained. The only variation that I can find is that some give an acid reaction with the litmus paper, and others, an alkaline. Caustic soda also here improves the size made by this starch, giving the yarn sized by it a softness and pliability that could not be obtained without its use. In my opinion, it also prevents to a great extent the loom beating the size off the yarn in weaving. When I began using the caustic soda in my sizing, I found the cloth became heavier and I now find it necessary to run lighter numbers on my spinning to get the cloth down to the proper weight. In these days of fifteen cents cotton, this is no inconsiderable item.

Fourth in order comes Sago starch. Here I must confess ignorance as to the actual working of this starch, though in England it is used to a great extent on very high pick goods, and text-books describe it as giving the thinnest paste and strongest yarn of any of the starches. I have frequently seen it quoted at about two and one-half cents a pound, and though I have asked all dealers in starch, I know, for quotations, I find they have none to offer. One sells a starch under a trade name of a country from which Sago comes, but it is not a Sago starch. Comparing the price of Sago with that of potato, I think it well worth a trial from some of you who use potato starch on high pick goods, if it can be obtained.

Fifth and last of the starches to be considered comes rice. This starch is valuable to the laundryman but has no place in the size kettle owing to its harshness, brittleness and price.

Before leaving the subject of starch, I would like to emphasize the necessity of thoroughly boiling the size, so that all the starch grains may be broken up. This will add greatly to the softness and pliability of the sized warp, and improve the weaving and feed of the goods. If caustic soda is used, I would suggest that it be dissolved in the right amount of cold water used for the size mixing, adding the starch after the soda is thoroughly dissolved.

On heating this mixture just before it comes to a boil, you will find that the starch forms a very stiff jelly—so thick that the stirrers are not able to revolve. After a few minutes, the size gets thinner, so that the stirrers can again perform their duty.

The selection of the proper starch for the size is a matter requiring careful judgment, for the proper weaving of the cloth depends in a great measure on the work done in the slasher room. I cannot see the advisability, though, of paying a fancy price for corn starch merely because it happens to be called by an attractive name. A thorough examination under the microscope will tell the state of affairs. The best way to become familiar with their appearance is to get a potato, some corn, meal, flour, and rice and grind each sample separately in water, put a drop of this water on a glass slide, and compare the sample of starch with the appearance of each of the starches.

SOFTENERS.

We will now consider the softeners, the most important being tallow. A good beef tallow with suet or bone and marrow fat is dollar for dollar of value the best softener known for pure sized goods. There are any number of substitutes on the market, but they are produced with the idea of bringing a profit to the maker, rather than to benefit our weaving. These substitutes all contain from 40 to 80 per cent. of water and some contain starch, so

there is no reason why they can't be made at the mill much cheaper and a great saving in freight effected.

Other softeners of value to the sizer are cocoa nut oil, palm oil, castor oil, Turkey Red oil, Soluble oil or Castor oil soap, Japan wax and paraffine wax. This last wax should never be used on goods intended for bleaching as it is extremely hard to wash out and causes uneven bleaching and dyeing. The soaps both hard and soft are used in light sizing and are of considerable benefit in some cases. They can be made cheaper at the mill, for they all contain water in large proportions.

DELIQUESCENTS.

Next, come those substances that give strength and pliability to the warp through their ability to absorb moisture through the atmosphere. The three most important being magnesium chloride, calcium chloride, and glycerine. The first two should be used very cautiously in a mixing, for they are liable to cause mildew, and are decomposed in the process of singeing, forming hydrochloric acid which makes tender the goods. Glycerine is subject to the first criticism, but has no evil effect on the process of bleaching and in weave sheds not properly humidified, the addition of from 5 to 2 per cent. of glycerine to the size helps very materially. The high price of glycerine prevents its more general use. Crude 80 per cent. glycerine being quoted at 20 cents a pound. When either of the last three named substances are used, it is sometimes necessary to use a disinfectant to prevent mildew—the more common ones being chloride of zinc, carbolic acid, and salicylic acid. Just enough should be used to prevent trouble, as more only adds to the cost.

One of the best slasher men I have ever known used a small quantity of blue stone or copper sulphate in his mixing. The chief value of this as a sizing ingredient, I think, would be as a disinfectant, though he claimed he used it to make the yarn part better at the lease rods. Another substance used in size is glaubers salts. This has properties opposite to calcium chloride and glycerine—giving up its water of crystallization on exposure to the atmosphere and imparting a stiff boardy feel to the finished cloth.

ELEMENTS OF A PROPER SIZING MIXTURE.

Three elements enter into this question, the most vital being the obtaining of good weaving; next, that of cost, and last, the simplicity and ease with which it can be prepared. I contend that between two size mixings giving the same results in weaving and costing the same, the simpler one should be given the preference.

An analysis of most prepared compounds shows that they contain from 40 to 80 per cent. water. This does not apply to all of them, however, for there are some very valuable preparations on the market that can only be handled when diluted with water. It is a matter of some difficulty to get at the true results of a given mixing, owing to the difference in the strength of the yarn being used at the time of making the experiment and the personal equation introduced by the weaver. A test by those of you using print yarns of the following simple mixing will show, I believe, as good results as are obtained by using some compounds.

Take the same amount of water as used in the regular mixing and dissolve in it one pound of caustic soda, if as much as 120 gallons are taken. Add to this the usual amount of starch and tallow, leaving out all compounds. If a large amount of compound is used and this appears to be of a greasy nature, add ¼ as much tallow in addition to the amount above mentioned as there is compound ordinarily used. Cook the size two hours before using, adding the tallow after mixing boils. Here is as simple a mixture as one could wish and one I dare say will run as well as the average. I do not claim that it is the best possible combination. The judicious addition of some other ingredient will no doubt help the work. The only objection to the use of caustic soda is that it is possible to injure the woolen blankets on the slasher if too much is used. I have used as much as two pounds to 110 gallons of water for months, and have found no injurious effects from it. As to its effect on the cotton fiber, and the subsequent process of bleaching, will say all cloth is washed in a solution of caustic soda before being bleached.

And lastly, a word as to the operation of the slasher. The idea is prevalent that the size is put into the yarn by the immersion roll. I believe, rather, it is forced into the yarn by the pressure of the flannel rolls, and that by increasing or decreasing the thickness of the covering a heavier or lighter sized yarn results; also, that by putting on a heavier roll and increasing the thickness of the flannel a better finish will be put on the yarn, though I have never had a chance to experiment on this, as I have only the rolls furnished by the slasher makers.

THE CARD ROOM.

BY R. L. BIGGS, ROCKINGHAM, N. C.

PICKERS.

Carding, as has been acknowledged, is the most important process in the course of cotton manufacture, and it is absolutely essential that the fibers come to the cards in as perfect condition as modern opening and picking machinery can make them. Good opening, picking, clean-

R. L. BIGGS.

ing and evening in the picking room have lots to do with the evenness and running of the work throughout the mill. The laps should be kept even in weight. If they are not, the succeeding work will not be even. One of the greatest evils in our mills today is the way the mixing is carried on. A great number of carders will have their days run trucked in, turn the bales on their sides, remove the bagging and feed from the top of the bales, leaving it to the operator to do the mixing properly, besides the half dozen other duties he has to perform. This is absolutely wrong. Cotton should never be worked from the bale and mixed in this fashion. It cannot be evenly mixed in this manner.

In the first place, cotton in the bale is compressed and damp, and should be opened up and left to dry out and expand before using. The more bales that can be mixed at a time, the more uniform the mixture, the better the work will run, and the more even the yarn will be. I find that the dryer cotton is, the better the pickers will do their work, but we have to have a certain amount of moisture before the laps reach the cards. If they are either too moist or too dry they will split. Pickers should always be kept in first class condition. The draught on the screens should be kept even, and the beater blades should always be kept perfectly sharp and set right. These are two points that must not be overlooked, as they are absolutely necessary to insure good work from the pickers. There must be no slippage in the fan belts, and if the dust outlets are in a trunk system it must be so arranged that there is no back draught on any of the fans.

CARDS.

Carding is for the sole purpose of cleaning the light foreign matter from the staple, combing the staple out straight and placing it in a parallel position. A great number of carders make the mistake in believing that the cards even up the sliver. It is evened up to a certain extent between the cards and slubber, but not enough to be depended on. The thing to do is keep the lap right. If you have a good man on your finishers this is an easy matter.

Card clothing is very frail, delicate and expensive, and for this reason an effort should be made to place the cotton in the very best state obtainable before delivering it to the cards. If this is done, the cards will have less work to do, the clothing will wear longer, give better results and need less grinding. Every time a card is ground it should be realized that the life of the clothing is one day shorter. The more you grind the wire, the shorter and more rigid it becomes in the foundation. It is the springy action of the wire that does the work, and when this is removed the backbone of good carding is lost. The flats require special attention and should be kept sharp, with as little grinding as possible. For all these reasons everything possible should be removed which will dull or damage the clothing of a card.

DRAWINGS.

If cotton is properly delivered to the cards, and they are in good shape, lickerin is sharp, and all parts set up right, you may rest assured it will reach the drawings in good shape. But here is another place that is very much neglected. The rolls should be kept properly oiled. We should never allow the rollers or gearing to wear for lack of oil, as just a very little lost motion on these machines will cause bad work. All gearing should be set up properly and looked after daily. Examine all weights daily and keep hanging properly. Keep all bruised places filed off of the rollers with a file made for this purpose. Never use a piece of card clothing on steel rollers. If they are gummed and rough use pumice-stone for cleaning and polishing. Card clothing will ruin steel rollers. Space your rollers yourself, then you will know they are right. Don't depend on the shop-men to do these important things. They have been trained mechanically. Never speed drawings too fast. One great mistake the machine shops are making is driving drawings overhead. They should be driven from below. There should not be any shafting or belts over drawings. The gummed belt dressing and accumulated lint on belts and pulleys fall into the cans and on the sliver, causing the rollers to lap up and damage the sliver.

FLY FRAMES.

Fly frames should be kept clean, and each spindle and flyer looked after just as though there were only one instead of hundreds. The spindle and bobbin gear should be cleaned several times each year, and properly set, at the same time replacing all worn gears. The steel rollers should be taken out at the same time and cleaned and polished with pumice-stone. All damaged skewers and bobbins should be thrown away, the creel steps looked after, and all broken and lost ones replaced immediately. Clearers should be kept in good shape. The weights on the under-clearers should not be allowed to rest on the roller beam. The cloth on the top clearer should rest firmly and evenly across all rollers. The rollers should be picked every day. Rollers must be properly spaced and top rollers kept in perfect line with steel rollers. The tension must be kept correct on the fly frames.

The operatives should not be allowed to wrap the roving on some flyer fingers more than others. See that all top rollers have the full benefit of the weights. Care must be exercised in making changes to set the gear properly. All ends should be pieced just as short as possible. In piecing up an end in the flyer it should be twisted just enough to keep it from breaking back, but no more. Use a gauge for leather rollers, and put two of the same size on each arbor. This will prevent bad work from top rollers, provided they are in good shape. The draft on each machine should be just right. The humidity in the room should be kept about 60/70, that is, about 60 degrees wet and about 70 degrees temperature. Keep the floors clean. Brush the overhead shafting once or twice a week all over the room. Fan off the flyers with the frame stopped, just before each doff.

Every machine should be properly lubricated at the right time, and special attention given the oiling of the shafting. All machinery throughout the mill should be examined with a level, at least once each year, and if out of line put back in shape again. Machinery ought to be thoroughly overhauled once every two years. Parts that are broken ought to be patched or replaced immediately. All gearing must be covered to prevent accident. Each employee should be assigned his or her duty, and taught to do it well. Experience has taught me that the more busy you keep the help the more satisfied and contented they are. Teach them that machinery is expensive and should be handled carefully. I have seen many shipper levers snapped off fly frames through anger. Go after

your help in a sympathetic way. Always be sure you are right before you speak, then approach them in the right sort of a way, and the chances are that you will be surrounded with a loyal and obedient lot of workmen; and what makes work seem lighter and success more assured than to be among workmen who have your interests at heart?

COTTON MANUFACTURING IN LATIN-AMERICA.

BY W. A. G. CLARK, SPECIAL AGENT OF THE DEPARTMENT OF COMMERCE AND LABOR.

The 20 independent countries of the Western Hemisphere lying to the south of the United States are usually lumped together under the heading of Latin-America. Portuguese is spoken in Brazil and French in Haiti, the other 18 using the Spanish language. The great bulk of the cotton goods requirements of these countries is, and will continue to be, imported, but 10 of the 20 now have local mills. In only three of these countries—Brazil, Mexico and Peru—is there much prospect that the local industry can secure any appreciable share of the market, but wherever there are any mills at all there is a demand for higher tariffs, and it is of interest to American manufacturers to see what our southern neighbors are doing along this line.

I have recently returned from a trip through Latin-America in which I visited and studied the cotton goods markets of all 20 countries, and incidentally reported on their capability to compete with us in cotton growing and cotton manufacturing. Reliable data is difficult to obtain but the best estimates I could secure show the distribution of the cotton mills as follows:

Countries.	Mills.	Spindles.	Looms.
Brazil	137	1,000,000	35,000
Mexico	139	726,278	25,000
Peru	7	52,250	1,750
Colombia	5	20,000	300
Venezuela	2	11,000	250
Argentina	6	9,000	1,200
Guatemala	1	6,000	150
Chile	3	5,000	400
Ecuador	4	5,000	200
Uruguay	3	.....	300
Total	307	1,834,528	64,550

There are no cotton mills in Cuba, Haiti, Dominican Republic, Salvador, Honduras, Nicaragua, Costa Rica, Panama, Paraguay, or Bolivia. The capital invested in Brazilian mills is estimated at $75,000,000, and that in Mexican mills at $50,000,000; so that, including knitting mills, the amount of capital employed in cotton manufacturing in Latin-America is probably about $140,000,000. The factors that make for the development of the cotton manufacturing industry in any country are cheap cotton, cheap skilled labor, cheap power and cheap capital, and in countries not enjoying these advantages cotton manufacturing is only possible under the protection of high tariff walls that prevent outside competition. Interest rates in Latin-America are high, and skilled labor is both scarce and dear. Coal is mainly imported and costs mills at Orizaba, Mexico about $7.50 a ton. Peruvian mills under a moderate tariff are stationary in spite of a sufficient supply of local cotton, and the Brazilian and Mexican mills owe their development entirely to the fact that they have excessive tariffs.

Brazil is the only one of these countries that can ever raise enough cotton to have any effect on the world's market, and even then not until there has been a radical change from the present primitive methods of growing. The Brazilian crop is now about 300,000 bales and is stationary. In Peru cotton is grown entirely in small oasis-like valleys formed by small rivers from the mountains breaking through the sands of the barren West Coast. This cotton is also grown entirely by irrigation and now amounts to about 110,000 bales. Two-thirds of the Peruvian cotton

W. A. G. CLARK.

growth from American upland seed, but one-third is "Rough Peruvian" tree cotton that never goes to a cotton mill but is taken by the woolen mills to mix with wool in making "all-wool" clothing.

We are also the only country that uses short spinning frames. In Latin-America, as in the rest of the world, the ring frames run from 300 to 400 spindles each and have the English system of top rolls, consisting of one leather covered front roll with suspended weight and two self-weighted bare iron back rolls, the middle roll being 13/16 inch diameter and the back roll 2 inch diameter. The mills usually use single roving and short draft, which is preferable with the type of rolls. As in the case with all countries in which cotton manufacturing is of recent date, there are few mules, and ring spinning is the rule.

The bulk of the looms are of the overpick type. Some of those with the underpick motion are fitted with the Northrop battery and these are made under the American patent in England. The mill managers claim that the overpick motion, which gives a more gradual development to the picks, enables them to use higher speeds, and in all mills where there were looms of both types I found that the underpick looms were set to run at a slower speed. In the Pernambuco mill for instance on 24-inch gray sheeting they were running underpick looms with Northrop at-

tachment at 180 picks a minute while they claimed to be getting 230 picks a minute on the overpick looms.

Some of the larger mills are very careful about opening up and aging their cotton before use, and a few of them also age their yarn. In one Brazilian mill I found that they made it a practice to keep 100 bales of cotton opened up in the bins all the time and to use the contents of each bin in succession. The mills follow the English custom in most regards and usually have the cotton opened up and run through a bale breaker in a separate room. From the bins it is blown through a delivery pipe to the picker room where it is run through the opener-picker, intermediate and finisher lappers. The lappers are usually of the 40-inch width and in going through the three machines the cotton is subjected to the action of three beaters. Two-process drawing is the rule, three being only used for the finer numbers.

BRAZIL.

Brazil is the most important cotton manufacturing country in Latin-America and its mills turn out annually over $40,000,000 worth of cotton goods which is about two-thirds of the total requirements of the republic. The mills make mainly gray goods and coarse colored cottons under 28 inches wide, though there are seven print mills with 30 printing machines, and a few of the larger mills are now making white shirting muslin, lawns and fancy work of good quality. Some of the larger and better managed mills make very large profits, as do some of the small coarse goods mills that are situated in the interior where the lack of transportation facilities increases the cost of imported goods; but the competition is so keen on the coarse goods on which most of the mills are operating that the mill industry as a whole does not average over 8 per cent. a year even with the advantage of very high tariff duties.

The Brazilian mills are dependent entirely on the tariff as they have practically no other advantage. The cotton fields are in the north while the bulk of the mills are in the south and not only are the transportation and handling charges high but each state levies an export tax on all cotton that goes out over its borders whether abroad or to neighboring states. All machinery is imported and subject to heavy duties as are practically all mill supplies. The Government levies a direct tax on all mill sales, and the mills have to purchase stamps from the government and affix one to each bolt of cloth turned out. About half of the mills are run by steam power and have to pay high for imported coal; about a fourth are run by water power, while the remainder, including most of the large mills located around Rio de Janeiro and San Paulo, use electric power and pay about $50 a horsepower a year in 1,000 horsepower lots.

Brazilian mills are unique in not using any humidifier arrangement, the managers saying that the operatives object to humidifying as unhealthy. At the same time many of the mills keep their spinning rooms close and at such a high temperature that girls can not stand the strain, and only men and boys can be employed on the frames. There is no color line in Brazil and negroes, half-breeds and whites of both sexes work side by side without discrimination. The overseers and foremen are usually English, and as there is little published in Portuguese on practical mill work and the English foremen do not teach their assistants more than absolutely necessary for fear of finding themselves displaced, there are yet few mills operated exclusively by Brazilians.

Wages vary considerably in different parts of Brazil and are much cheaper in the north than in the south and of course cheaper in the country districts than around the big cities. At a mill as Pernambuco for instance, I found that picker room hands and carders were paid 75 cents a day. The women and boys on the draw frames ran one frame of seven heads each and averaged about 32 cents a day, fly frame operatives averaging about 75 cents a day. Each 320 spindle spinning frame required one man at 75 cents and three boys at 24 cents a day running, on No. 8s and doing their own doffing. Weavers on 24-inch gray sheeting were paid 18 cents for a 32-8 yard cut. Weavers ran from two to four looms each, the ordinary three loom weaver averaging about 90 cents a day. At a correspondingly large mill near Rio Janeiro the picker room men averaged $1.05 a day, the carders $1.30, draw frames tenders 65 cents, and fly frame operatives $1.20 a day. Running on No. 30s the spinners therefore made 81 cents a day. The spinners in this mill were girls. Doffer boys were employed and paid 36 cents a day. The weavers were mostly women and a good four-loom weaver averaged about 6 milreis or $1.82 a day.

There are 11 mills in Brazil with more than 25,000 spindles apiece. The largest mill is the "Fiacao e Tecidps Allianca" near Rio de Janeiro with 56,390 spindles and 1,336 looms, employing 1,637 operatives. The mill with the most looms is the Fabrica Mariangela at San Paulo. This mill contains 36,000 spindles and 1,700 looms and employs 2,200 operatives. This mill works on more varied lines than any mill I saw in Brazil. It spins its own yarns. Most of the looms are on cloth under 28 inches wide, but some cloth is made up to 54 inches. The mill not only makes gray sheetings, drills, checks and stripes, dyed goods, and white goods, but also dobby work, and has both hand and power Jacquards for making bed spreads, vestings, etc. It also has ribbon looms, hosiery machines and large knitting machines for making knit stuff to be cut out and sewn into undershirts. There was a complete waste-spinning plant consisting of a breaking-up machine, a combined picker and opener, two double automatic waste cards using tape condensers and making 40-sliver laps at a time for use on the waste mules. The waste yarns were used partly for making scrubbing cloths and partly for making osnaburgs for baling mandioca (the native flour), the sacks being made up in the mill. In addition to the above work there was a cotton gin and a cotton seed oil mill, with soap making apparatus, also attached to the mill.

The Brazilian mills in baling their cloth rarely use any ties or ropes. In baling they put 15 to 20 bolts or 30 meters each in the press and tie three strands of some 20 or 30 ends of colored yarn around the compressed package. They then sew burlap around the package and ship without any outside fastening. Some of the mills use burlap, but a large number use only coarse sheeting, made at the mill, which they claim is usually cheaper for baling than the burlap.

The ordinary mill hours are from 6 to 10, 11 to 1 and 1:30 to 5, making 9½ hours a day. On Saturdays they stop at 3:30 thus making a 55 hour week. In Brazil the custom, even at the hotels, is only two meals a day; break-

fast at 10 and dinner at 6 o'clock with a cup of coffee and hard roll in the morning and another at one o'clock if desired. The mills rarely work at night but in flush periods sometimes run up to 9 o'clock at night. There is no law as to hours of labor nor as to the age at which children can be employed.

MEXICO.

The Mexican mills run mainly on coarse goods of narrow widths, but there are about half dozen mills that make goods of medium fine grade, including white shirtings, muslins, organdies, fine prints, zephyrs, napped goods, handkerchiefs, napkins and towels, that compare favorably with those imported. The average mill is small and contains 5,225 spindles and 182 looms. There are only four mills with over 25,000 spindles. The largest and best managed mill is the Rio Blanco at Orizaba with 44,184 spindles and 1,675 looms making medium and high class white, colored and printed goods. This mill spins up to 80s, which is the finest number spun in Mexico and uses a small amount of Egyptian cotton. The men in the picker room at this mill average about 50 cents a day, the carder about the same and draw frame tenders 45 cents a day. For weaving 27-inch gray sheeting 48 x 48 construction, the weavers are paid 12 cents per 27 meters or 29½ yards which is the regulation length cut in Mexican Mills. This mill has a complete waste spinning department with 6 double wool cards and 2,400 mule spindles and works up all its own waste. There are 41 printing machines in Mexico and a few bleaching plants. There are a few dobbies, Jacquards, etc., but the bulk of the mills are fitted only for coarse gray and colored cloth and their profits are reduced by the strong competition among themselves. The Government levies a direct tax of 5 per cent on all mill sales.

In normal times the Mexican mills run night and day and usually figure on 135 hours a week. Working in the daytime only, as at present the mills run from 6 to 8:30, from 9 to 1, and from 2 to 8 p. m. making a 12½ hour day. A few of the mills are running from 5:30 in the morning to 9 at night, marking a 14 hour day which is as long time as is worked by the mills in India which are supposed to work the longest hours and to have the most inefficient help of any mills in the world. There is a Federal law which says mills shall not work over 12 hours a day including an hour for lunch and which also prohibits the working of children under ten but there is no attempt to enforce these regulations.

The price of cotton in Mexico is based on the price of American cotton plus the freight and intermediate charges that Mexican mills have to pay about 3½ cents a pound more for cotton than do mills in the United States. Coal is so high that wherever possible the mills are utilizing water-power. All machinery is imported and has to pay freight and duty. The duty is very high, but the mills have practically no other factor in their favor. In flush periods some of the mills have made very high profits but even the best mills do not seem to average over 6 per cent. a year and the average for the whole industry would be still smaller.

KNITTING MILLS.

Besides the regular spinning and weaving mills there are in the cotton manufacturing countries quite a few knitting mills and these make mainly knitted stuffs to be cut up and sewn together for undershirts. This is an industry that can be started with a small capital and in these countries the native mills are already beginning to monopolize the demand. As yet there are few mills making other knitted stuffs from Germany with the finer grades from France and England.

There is an annual import into Latin-America of some $3,000,000 of cotton yarn of which Argentina accounts for about half or $1,500,000, Brazil and Chile each for about $600,000, and Mexico and Uruguay each for something over $50,000 worth. The United States furnishes about a tenth of the Argentine yarn supply but does very little in the other countries in this line. A large portion of the yarn imported is for the use of the knitting mills, of which there are 43, large and small, in Argentina alone. Some of the yarn classed under the head of yarn is braided and twisted yarns for making wax matches and for weaving cloth hammocks, etc., while a small portion is for the use on the handloom.

The handloom industry of Latin-America is small as compared with that of the East, but there are a good many handlooms used by the Indians of the central part of South America and also some in Mexico and Central America. On the Andes there is more hand spinning and weaving of sheep's and llama wool than there is of cotton. In making cloth from native cotton, the seeds are usually picked out by hand or else a primitive gin employed consisting of two rollers turned by a hand wheel. The spinning is of the most primitive type known, and the women spin while they sit on the ground in the market place selling their wares or as they trudge along behind their flocks of sheep or llamas. The only instrument used is a short stick of wood with a cross piece fastened on the bottom. In spinning they hold a bunch of cotton or wool in the left hand and with the right pull out fibers and smooth them into a loose sliver with their fingers as they do so. When about a couple of feet have been formed into a loose rope in this way the end is fastened to the spindle shaped stick and this with a dexterous movement of the wrist set twirling in the air or on the ground. When sufficient twist has been inserted in this way the yarn is wound up on the spindle, a hitch knot made around the end of the spindle and more fibers pulled out and smoothed into sliver, twisted, the knot undone and the yarn wound up, another hitch knot made and the process repeated as before. This system of spinning is the same that is used by the Igorrotes in the Philippines and by other primitive tribes and is behind the handwheel system used ordinarily by the Hindoos and Chinese. In weaving there are used handlooms of most primitive construction, usually with overhung lay, and in many cases they weave with anything that can be called a loom at all.

In reviewing Latin-America as a whole it seems that they will shortly be making all their requirements of undershirts and that Brazil, Mexico and Peru will dominate their home markets for most classes of coarse and medium grade goods but that in the other countries there is no prospect of the cotton mill increasing to an extent that will affect the sale of foreign cottons. In a normal year the cotton goods imports of Latin-America now amount to some $120,000,000 and of this only about a twelfth is from the United States while the biggest markets, those of Argentina and Brazil, we supply less than three per cent. of the total.

Mill Conditions and Market Reviews.

SOUTHERN MILL SITUATION.

(Special Correspondence.)

The situation affecting Southern mills at present is far from favorable, in fact there has recently been a revival of curtailment talk. During the first part of November there was considerable improvement shown in certain lines. Prices of yarns appreciated from one-half to two cents a pound. The upward trend, however, was not maintained, and a large percentage of manufacturers are now facing the necessity of adopting some policy of retrenchment of operating expenses. The situation in certain lines is far better than was the case a month ago, as some of the mills report fairly good business, and some have bought cotton ahead as far as July. It is the very fine and the very coarse goods manufacturers who are feeling the strain just now, and these are the ones who are talking curtailment.

There is said to be considerable accumulation of stocks on hand at present, and market prices do not offer a profit to the manufacturer. Unless the situation improves to a decided degree, it is likely many mills will have to operate only a part of their machinery during the winter months. This is not desirable from any standpoint, either to the mill or the operatives. But curtailment is no longer so much a matter of choice as one of necessity. It is not believed, however, that there will be any concerted movement between New England and Southern spinners looking in this direction, as was reported recently.

A well informed mill man in discussing the situation said: "It is hard to say just what policy will be the wisest to take, for the interests of no two manufacturers are alike in all respects. A large cloth manufacturer told me only this week that he was doing a thriving business, making goods at a profit, and had bought cotton enough to run him to the summer. Another declared that he would be forced to close down his plant on account of the unfavorableness of the situation. Just now the New England manufacturers are faring better than those of the South. Many of them have bought cotton ahead to run them to the summer, and these report a small margin of profit in full time operations."

"This is not the case in the South, by any means. Here many of the mills which are now running are not making any margin of profit. It is most likely that curtailment will be carried on by many Southern mills during the next few months, but it is hardly likely there will be any general agreement to this effect. The policy governing mills will more likely be, as it has been, an individual one. Some of the mills have bought no cotton ahead, and are not planning to. Others have. Some of them are making both ends meet. Others are not. Those mills which are making goods anywhere between 2¾ and 4 yards are in very good shape. These will hardly curtail, so long as they can prevent a disorganization of forces by continued operation. I do not think the big mills of South Carolina will take any further action in the direction of organized curtailment, neither do I think any such action will be taken by any of the textile associations of the South."

An important case affecting rates on towels was heard in Charlotte, N. C., recently, and compromised. The Cannon mills at Concord, and Kannapolis had filed complaints against rates charged on shipments to the West with the Interstate Commerce Commission. Special Agent Boyle, of the Commission, came to Charlotte to receive statements from complainants. The Cannon Mfg. Co. had filed complaints against the Southern R. R., and a large number of railroad lines between the line of the Southern and the Pacific coast. A new classification of freight rates on towels was asked, to the Pacific Coast, the complainant desiring that classification be the same as the present rates on cotton piece goods. The case was compromised before the complaints were heard by the special examiner Boyle.

Mr. Boyle had a record made of the settlement, which was sent to the commission. Mr. Boyle has gone to Columbia, S. C., where he will hear similar complaints.

Many of the large mills in Greenville, Spartanburg, Columbia and other manufacturing centers of the Piedmont have just held stockholders' meetings and declared the regular semi-annual dividends, varying from three to five per cent. It is a notable fact, however, that despite the depression in the goods markets, capitalists continue to show no hesitancy in putting money into new mill properties, and in the improvement of established plants. During the past month many increases in capitalization have been made. The Woodside Mills, at Greenville, S. C., have increased their capital from $800,000 to $1,200,000. The Loray Mills, at Gastonia, N. C., have increased their stock. A new $900,000 mill, to make India lawns, is being promoted at Greenville, S. C., and already $750,000 of the stock has been subscribed.

The meeting of the Southern Textile Association in Charlotte, N. C., on November 26th was a notable event in mill circles. This association has for its objects the promotion of a closer relationship between operatives and mill owners, and the promotion of the interests of the industry in the South. It was organized in Charlotte two years ago with 30 members. Today it has over 750 and prospects of continued growth. Many mill owners, machinery and supply men were present, and the meeting was a great success. Over 300 delegates were in attendance.

NEW ENGLAND MILL SITUATION.

(Special Correspondence.)

The October improvement in the demand for cotton goods from New England mills was not continued into November, and the immediate situation is one of grave doubt concerning the permanency of occupation. The gingham mills continue well provided with business for some months to come, the orders in hand being made more secure by the desire of buyers for prompt shipments on delivery dates. The staple gingham conditions are also firmer in consequence of the limited loomage available in the larger mills while the call for dress ginghams is so steady.

Mills making tickings and the better qualities of denims are also well employed for the next month or two, but be-

yond that date the outlook is hazy. Coverts and suitings are also fairly well under order until after the turn of the year. Mills making fine specialties in cottons for the dress goods and fine retail trade, and mills making fine yarn open weave cottons, such as voiles, marquisettes, tissues, zephyrs, etc., for wash goods departments, are as busy as they can be in filling old orders for Spring, and in trying to meet the re-orders of jobbers whose salesmen have about completed their initial rounds to the Spring retail buyers. The mills making good qualities of napped cottons, such as blankets, flannellettes, etc., are not complaining of the volume of business in hand for the time being, but they too are looking forward with some anxiety, toward the long future.

The mills making plain convertibles, print cloths, lawns, linons, etc., still have some orders on their books and they are running within 85 to 90 per cent. of their capacity. But within the past month they have not witnessed the development in the demand for contracts which they were prepared for and anticipated, and their managers are uneasy as to the likelihood of a demand developing in sufficient volume to warrant steady and full operation after the turn of the year.

A serious source of trouble with the mills has been the maintained high money rates in the period when they would like to purchase some part of the fine staple cottons they will require for the season. Even some of the best mills have been forced to pay 5½ per cent. as compared with 3¼ and 4 per cent. last year. One of the largest of the Rhode Island manufacturers has not purchased but half the supply of cotton he will require if his mills operate in full for the season. This is unusual in his case yet it is a type of what the large concerns are doing. The price of cotton and the rates for money would not deter cotton purchases if the values placed upon cloths in the market showed a promise of profit or an avoidance of loss.

It is known that leading manufacturers have discussed the wisdom of curtailing after the turn of the year, but it is understood that unity of action in any form of agreement will not be possible until after February as many mills will have to run in full until that time to meet the contracts now on the books. The mills whose contracts begin to expire about the turn of the year will curtail on their own account and at the present moment Fall River manufacturers are going cautiously in the matter of building up stocks while New Bedford manufacturers are shutting down plain looms and avoiding accumulations.

The bleacheries and print works are quite busy for the time being. But their managers say their contracts will cut off sharply as the year draws to a close, more particularly on the more staple fabrics. Printers of fancies and novelties, like the Arnold (job work), U. S. Finishing, and Pacific, have business enough ahead on many things to keep them well employed through the Winter, while bleachers will begin to run out as early as the first week in January, unless new business comes in before the middle of December. All admit disappointment at the failure of the November demand.

The sales of print cloths and convertibles at Fall River during any one week in November did not equal the limited output, and in the last week of the month the sales dropped to 45,000 pieces of which half were for spot delivery. Some small export trade for staple prints went to the American and Algonquin Printing Companies, but there was no export trade in denims, drills, or sheetings. The cotton yarn mills are moderately well employed but the large concerns are not running in full, although some mills are running full time. Exceptions may be made of yarn mills making specialties and the finer combed yarns.

The strong feature in the situation continues to be the limited stocks of goods mills are carrying. Manufacturers feel that once the financial pressure is removed from business in general there must come the character of demand for merchandise which will lift cloth prices to a parity with cotton costs. The avoidance of accumulations of goods is regarded as a prime necessity of the general mill policy. In years when jobbers have been uncertain concerning the outlook for cotton and when they have been facing a restricted demand from their trade they have usually postponed their operations on staple domestics, such as brown and bleached goods, until after December 1. Consequently there is a strong feeling among some manufacturers that a renewal of the demand of October will be noted in the next two weeks. If it fails to materialize it is reasonably certain that curtailment of the output will begin promptly after current orders are completed.

A financial analysis of the annual mill reports shows that many well equipped plants were forced to draw upon surplus earnings for dividends and with costs of raw material, wages, and money, high, there will be every inducement not to accumulate stocks. The consensus of opinion among commission agents is that New England cloth stocks were brought down sharply by recent shipments.

In a list of mills that have recently ordered Draper looms, some important New England mill names appear. The Draper Co. is now reported as busier than for some months past. Samuel E. Hathaway, who had been general superintendent of the Iron Works mills of Fall River, the concern that supplies the American Printing Co. with cloth, died during the month. The superintendent of the print works severed his connection with the concern a short time previously.

Building operations on mills already planned at New Bedford are going ahead steadily, and the statisticians there think they will be able to show a total of 3,000,000 spindles in that city before July 1. The impression that fine goods production now exceeds the demand or consumption is quite general in the New York market. The new Hoosac Co., which has taken over the cotton mills formerly owned by the Arnold Print Works, and which is managed by N. B. Kerr, of the Butler Mills, New Bedford, is now selling its goods direct in the New York market.

The Stevens Mfg. Co., Fall River, and Monument Mills, Housatonic, Mass., manufacturers of cotton quilts, have sold up their products for Spring, 1911. The products of the Tremont and Suffolk Mills of Lowell, Mass., will be sold through Catlin & Co., beginning December 1.

Credit for Article.

The November issue of COTTON contained an article on "The Nature and Cause of Waste Fiber in the Mills," by Prof. R. J. H. Deloach, Athens, Ga. This address was delivered before the National Association of Cotton Manufacturers at its spring meeting in Boston, Mass. Through an error, proper credit was not given in connection with the publication of the article.

MONTHLY COTTON MARKET REVIEW.

H. & B. BEER, NEW ORLEANS.

During the past month the market has ruled comparatively steady, for while fluctuations have been had, they have been confined within a narrow range, the prices at the end of the month being only a shade higher than last month. Were it not for the general freeze that made its appearance in the South during the closing days of October, it is probable that values would have ruled lower. The freeze was late in making its appearance, especially East of the Mississippi River where the same character of weather was experienced by October 12th last year and year before last, but as the crop was supposed to be late this year in all States except Texas, the claim was made that serious damage to the crop had been done by the cold weather.

It is our opinion, that owing to the unusual warm, dry weather during September and in October until the close of that month, a good crop had already been made before the cold wave appeared, but in this contention opinions are divided; the majority claim that late cotton was nipped by the freeze, putting an end to all further growth, thereby making it impossible to gather a large crop. Even at this late date advices from the interior are conflicting as to the extent of the damage done by the freezing weather, many complaining the greater portion of the late cotton to have been killed, while others state that the damage done has been exaggerated and that many of the bolls have opened and that more will open, the weather, as a rule last month having been favorable for opening of matured bolls; generally fair.

As to the probable size of the crop there is as much of a divergence of opinion as there was one month ago, the general idea being that the year's production will not be more than 11,500,000 bales, which accounts for the readiness of the market to respond to influences bearing the least semblance of a bullish nature. However, it is probable that the crop is being underestimated, as the last Census report on quantity of cotton ginned would indicate. To November 14th, 8,764,000 bales had been ginned this year aganst 8,112,000 last year, which is a rather good showing considering the lateness of the crop. To November 14th last year 80.5 per cent. of the crop had been ginned, but last year was an early and very short crop, which made it possible for so great a percentage of the crop to be ginned on said date. To November 14th of year before last 73.3 per cent. of the crop had been ginned on November 14th, in 1907, 66.0 per cent., and in 1906 only 65.9 per cent. The average ginning of crops to November 14th for the years 1908, 1907, 1906 was only 68.4. We are of the opinion that not more than 70 per cent. of the crop was ginned to November 14th of this year, and as 8,764,000 bales had been ginned to that date, we believe that the crop will be larger than generally expected. In this connection some well informed people place the probable yield at 13,000,000 bales. In the meantime, however, estimates range from 11,000,000 to, 12,000,000 bales, some few high as 12,500,000 to 13,000,000, the latter being in the big minority, though in line with logical deductions.

The trade is making preparations for receipt of the Government's annual crop estimate of this year's cotton crop, linters, etc., excluded, which is due December 9th. The general belief is that it will be about 11,250,000 bales, which, with linters, etc., added, would point to a commercial crop of about 11,500,000. As to trade developments, there has been no improvement in this country, even in textiles, Fall River being unable to place its normal output; and as the tariff is to be revised, business is apt to remain stagnant for some time to come. On the Continent of Europe conditions are unsatisfactory, the high price of the raw material being the great drawback, East Indian cotton taking the place of the American product to a large extent. In England the situation is said to be more favorable, nevertheless Mr. Ellison estimates the probable consumption of American cotton this season at only 11,500,000 bales against 11,774,000 last season and 13,157,000 season before last.

THE YARN MARKET.

In considering the reactionary tone of the market during the past month, the fact must be kept in mind that prices of yarns have advanced within the last three or four months from 1½ to 2½ cents a pound; and this was in the face of a very small demand compared with the normal consumption of the spinners' product. The fact is that the yarn market has shown the beneficial effects of curtailment to a greater degree than the other divisions of the industry, and the fact that hosiery and underwear and dress goods have not advanced in price in the same proportion to raw cotton and yarns, is ample reason why buyers have been so reluctant in placing orders for yarns, and have practiced shopping to a greater extent than for many seasons.

While the market may be said to have sagged during the month, the reactionary tone and talk were confined principally to buyers who have been fighting the advance all along, and who availed themselves of every argument, both real and imaginary to bring about recessions in prices. The spinner, however, had but one alternative, either get his price or shut down his mill. The continued high price of cotton and the advancing tendency of the price of that staple have placed upon the spinner the necessity of getting an advanced price for his product, and so far he has maintained his position with distinctly gratifying results.

The end of October left the market in a comparatively favorable condition, and the mills were starting up and lengthening the working hours for the week. Buyers were quick to realize the significance of this resumption of operation, calculating that an accumulation of yarns would necessarily follow, especially if they remained out of the market for a while. This was one of the arguments used last month by buyers in an attempt to depress prices. Their success, however, was practically negligible with the spinners, although some dealers who had yarns on hand which had been purchased at a low figure, were willing to accept a small accumulated profit by effecting sales through a small concession in price.

The first part of the month found the spinners firm in their demand for prices which had been quoted during the latter part of the preceding month. As the requirements of the buyers were very small, and having been satisfied to a large extent by purchases during the preceding month,

the market was consequently left with a very little demand for yarns. It was claimed that the majority of buyers had satisfied their requirements, up until the first of January. Another factor which had tended to lessen the demand was the fact that some of the dealers who had sold yarn short, had been compelled to cover at advancing prices, and this bullish factor had then been practically eliminated from the market, as very little short selling was reported during the last month.

The middle of the month found very few inquiries for yarns and less actual business, the buyers holding off in the belief that concessions by the spinners would have to be made. They based their position on the fact that the mills had continued to operate and that necessarily accumulations of yarns must have ensued. If such was the case, however, the mills carried the yarns in their own warehouses, as very little of the product was consigned to dealers, as is usual when there is a poor demand.

At the end of the month there was very little business put through, except small lots which were purchased to fill in for some orders that required immediate delivery. There were no changes in the running schedules of the mills, which meant that there was comparatively little curtailment in progress at that time. Just how long operations will continue at the same rate is problematical. The demands for hosiery yarns at the end of the month showed a slight improvement and some very good orders were placed. This was probably due to the fact as mentioned previously in these reports that hosiery mills had sold their products without covering their requirements.

With the attitude of the spinners showing a disposition to maintain prices, and the fact that cotton showed an advancing tendency, there were very significant indications that yarn prices will at least hold their own during the lack of demand, and will show an advancing tendency with any resumption of buying by the weaving and knitting mills.

The following are the quotations at the end of November:

SOUTHERN SINGLE SKEINS

4s to 8s	21 @21½	22s	24 @24½
10s to 12s	21½@22½	26s	25½@25¾
14s to 16s	23 @23½	36s	26 @26¼
20s	24 @24¼		

SOUTHERN TWO-PLY SKEINS.

4s to 8s	21½@22	30s	30 @31
10s to 12s	22½@23	40s	31½@32½
14s	23 @23¼	50s	36 @38
16s	23½@23¾	60s	44 @46
20s	24 @24½	3-ply 8s upholstery	22½@
24s	25 @25½		
26s	25½@26	4-ply 8s upholstery	22½@
30s	26 @26½		

SOUTHERN SINGLE CHAIN WARPS.

8s to 10s	21 @22	22s	24 @24¼
12s	22 @22½	24s	25 @25½
14s	23 @23½	26s	25½@26
16s	23½@23¾	30s	26½@27
20s	23½@24	40s	32 @32½

SOUTHERN TWO-PLY CHAIN WARPS.

8s to 10s	21 @22	26s	26 @26¼
12s to 14s	23 @23¼	30s	26 @26½
16s	23½@24	40s	32 @32½
20s	24 @24½	50s	37 @37½
24s	25½@26		

SOUTHERN PEELER FRAME CONES.

10s	22¼@	20s	24 @24¼
11s	22¾@	22s	24¼@24½
12s	22¾@	24s	24¾@25
14s	23 @23¼	26s	25 @25½
16s	23½@	28s	25¾@26
18s	24 @	30s	26½@27

THE KNIT GOODS MARKET.

The feature of the knit goods market for last month was the opening of the Fall line of goods for 1911. The opening began about the second week in November, and in a couple of weeks the majority of manufacturers had placed their lines on the market. There was a great deal of uncertainty during the first of the month as to just when the opening would begin, and very few expected that it would materialize until later in the month. As soon, however, as some of the large mills began making their displays, the others were not very long in opening up their lines for the Fall season.

The business at the beginning of the month was stimulated by the advent of cold weather in many sections. Duplicate orders constituted a large portion of the business, and fleeced hosiery and woolen underwear were in excellent demand. The prediction that gauze, lisles and mercerized hosiery would continue popular through the winter was not carried out when the actual cold weather appeared. The belief that sheer hosiery would remain popular during the winter season was probably due to the warm spell preceding the cold weather.

The same complaint regarding the market was heard last month as in the preceding month, that is, that prices secured for the product were not satisfactory and yielded practically no profit at all. The West continued to hold the attention of the mills on account of its excellent demand for goods. Fancy half-hose were in considerable demand and proved somewhat of a surprise to some of the jobbers who were not expecting that class of trade. The business in Spring goods came in for a share of considerably more attention than for some time, and the belief was general that with the continued high price of cotton, prices on Spring hosiery will in all probability work higher.

The opening of the Fall styles for 1911 began with wool, worsted and fleece goods. The showing of cotton hosiery was made soon after the initial opening, and a great many of the selling houses put their men on the road with the new lines. One of the noticeable features of the new line was that the prices were practically the same as for the 1910 season, and as manufacturers were complaining so bitterly on account of the low prices received for their goods during that season, it would seem to be quite a question as to how they expect to do a profitable business with yarns to be purchased at a higher price than last season. A small amount of business for the new season was secured through the month, and ladies' fleeced hosiery and woolen goods were in very fair demand. It may be said that the opening of the new season was as satisfactory as anticipated, the only drawback being the low range of prices. The activity, however, was not confined to the new season, as orders for Spring goods continued to be received up until the last of the month, in very satisfactory quantities. Duplicate business not only gives a manufacturer work for his mill, but it indicates the styles and patterns that are most acceptable to the trade. There seems to be every reason for advancing prices in the knit goods market, and with the continued firmness in the yarn and cotton markets, it would not be surprising to have the knit goods manufacturers advance their prices in a manner to more nearly equalize profits.

COTTON MANUFACTURING.

LENO CLOTH WEAVING.

(Contributed exclusively to COTTON.)

BY PROF. THOMAS NELSON.

PART IV.

FULL-TURN LENO.

This class of leno is used principally for curtain goods, scrim, etc. The peculiarity of this weave is that the crossing end makes a complete turn around the standard end. Fig. 38 is a diagram illustrating the method of crossing with four picks in each change. The manner in which this crossing is obtained is illustrated at Figs. 39 and 40.

FIG. 38. DIAGRAM OF A FULL-TURN LENO.

A doup harness is not used in this case; only a doup is required. The doup is tied to a regular harness shaft in the manner illustrated in the diagrams Figs. 39 and 40. The small circle D on the end of the doup A is to represent a bead or small ring through which the crossing end F is drawn. This bead or ring is used for two reasons, namely, to keep the doup from passing through the reed, which is often the case if a bead is not used owing to the amount of slack doup and the length of the doup; and, to keep the doup from continuously wearing out and breaking, as would be the case if the crossing end was drawn directly through the doup. Only heavy or ply yarn is used on this

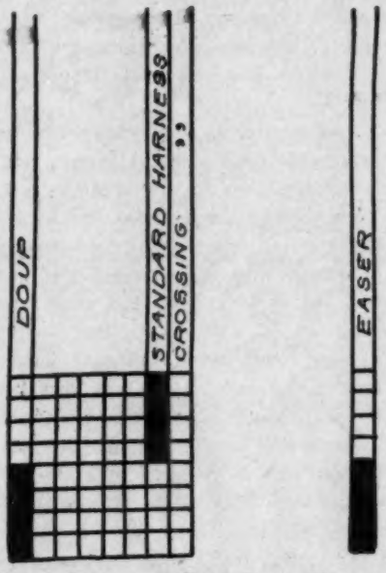


FIG. 41. CHAIN PLAN FOR FOUR PICK, FULL-TURN LENO.

weave, which, together with the strain in pulling the crossing end completely around the standard end, would very soon wear out the doup if a bead was not used.

Fig. 39 illustrates the open pick. A represents the doup; B, the standard harness; C, the crossing harness. The crossing end F passes through the crossing harness C and through the doup D. The standard end G passes through the standard harness B. The doup is passed over the top of the standard end, then back under the crossing end and tied to the doup shaft.

The open pick is made by raising the standard harness B as shown in Fig. 39. The crossed pick is made by raising the doup A and the easer E as shown in Fig. 40. It will be noticed how the crossing end F has been pulled first on the left hand side, then down on the right hand side and back again on the left hand side of the standard end G. Fig. 41 is the chain plan for this weave.

ADDITIONAL ATTACHMENT.

Owing to the extra length of doup required, if the doup shaft was connected directly with a harness lever in the dobby it would be an impossibility to raise the doup high enough to make the shed. An attachment similar to diagram Fig. 42 is frequently used. The doup shaft A is connected to a lever B fulcrumed at C and connected to a harness lever in the dobby at D. The amount of lift of

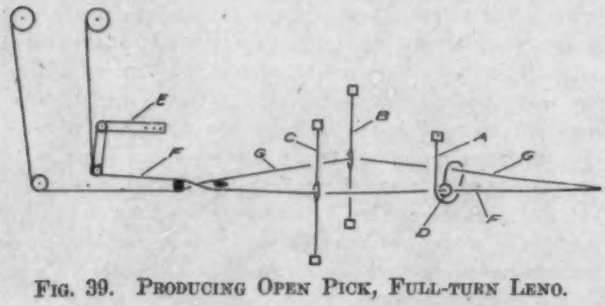


FIG. 39. PRODUCING OPEN PICK, FULL-TURN LENO.

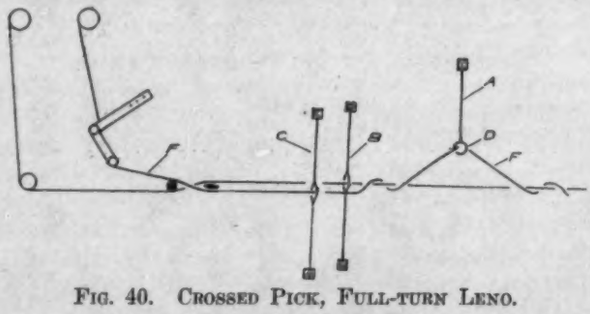


FIG. 40. CROSSED PICK, FULL-TURN LENO.

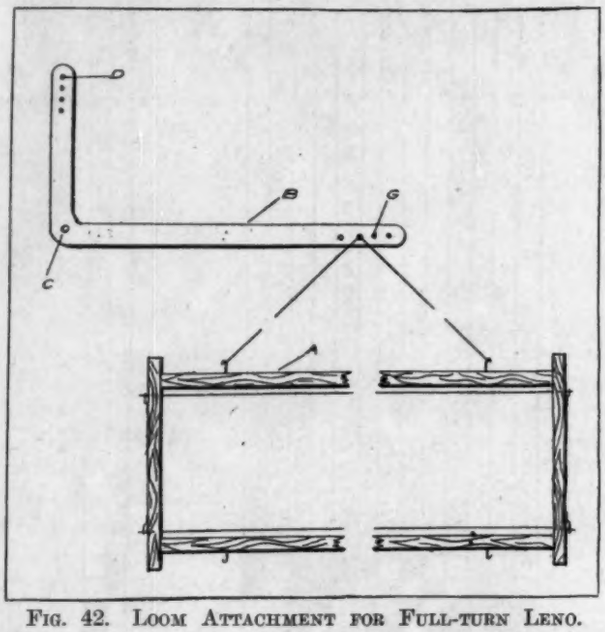


FIG. 42. LOOM ATTACHMENT FOR FULL-TURN LENO.

harness can be increased or decreased by using the different holes at D and E. It is advisable to have the connection at E, directly over the center of doup shaft A. The lever B must be held so that when raised, there will not be any vibration, otherwise the doup shaft will have a tendency to jump.

Fig. 43 is a sample of curtain goods made by weaving the full turn leno, the hemstitch leno and plain weave in the cloth. The chain plan for this pattern is given in Fig. 44. Four picks are put in at each change, both in the full-turn leno and the hemstitch leno, in fact it is not advisable to put less than four picks in the full turn. Either two, three or four picks may be put in the hemstitch leno.

The four picks in the full-turn leno of the pattern are divided in the hemstitch leno, that is, instead of having the four picks of both lenos put in the same shed, two of the picks from full turn pattern are put in the hemstitch leno then a change is made by the harnesses of the latter and the other two picks put in. This gives the diamond effect in the cloth. The space between the full turn leno and hemstitch leno is made by leaving empty dents. The space can be varied to suit the pattern, although it is advisable to leave a few empty dents to allow the change to be made. This fabric was made on a double index dobby with the loom running at about 150 picks a minute.

In making the full-turn leno patterns the following points will serve to simplify the designing and weaving of them: (1). Have all doups on the shaft the same length. This is very important, as a variation in length of the doups will cause the crossing ends to be unevenly raised, which is very troublesome. (2). Draw the ends in through the crossing and standard harnesses the same as for the hemstitch leno; then through the doup as shown in the sketch. (3). The open pick is made by raising the standard harness B; the doup A, crossing harness C and easer E are not raised. (4). The crossed pick is made by raising the doup A and easer E. The crossing harness C and standard harness B are left down. (5). The easer must always be raised when making the crossed pick.

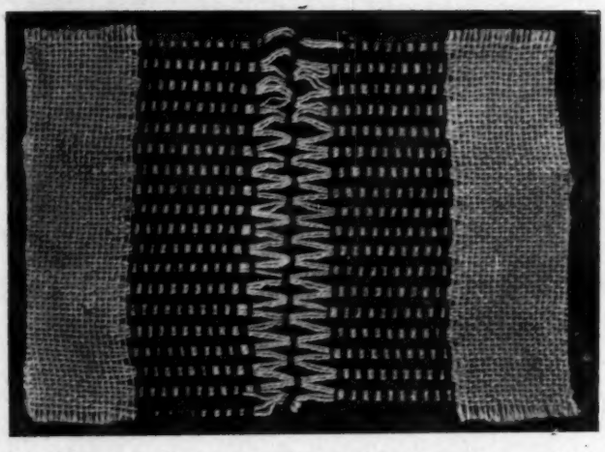


FIG. 43. SAMPLE SHOWING FULL-TURN LENO.

This type of leno is used in the fabric at the sides and occasionally in the middle of cloth, and only a limited number of ends are required. These ends are frequently taken from spools, separate spools being required for the standard and crossing ends, as there is a difference in the take-up. A small warp beam can be used as well as spools.

PRACTICAL ANALYSIS OF LENO FABRICS.

The analysis of a leno fabric differs from that of an ordinary fancy fabric. It is not necessary to pull a single end from the leno cloth in order to reproduce the fabric. Of course this can be done, and is often resorted to with fancy fabrics, even when the analyst understands the construction of weaves and their effects in the cloth, and the intersections of each end is indicated separately on design paper. This is not at all necessary when analyzing a leno cloth as a design does not have to be made; all that is necessary to reproduce the pattern is to make the chain plan, drawing in-draft and reed plan.

To illustrate this in a practical manner, Fig. 45 is given, which is a sample of leno cloth, composed of plain weave, hemstitch and net leno. It is advisable in the first place to make the chain plan, and after this the drawing-in draft and reed plan. The following points should then be

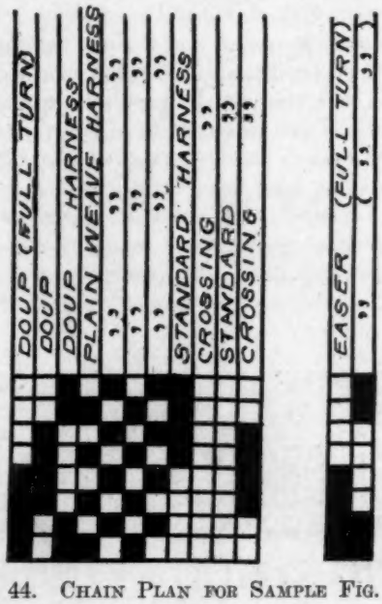


FIG. 44. CHAIN PLAN FOR SAMPLE FIG. 43.

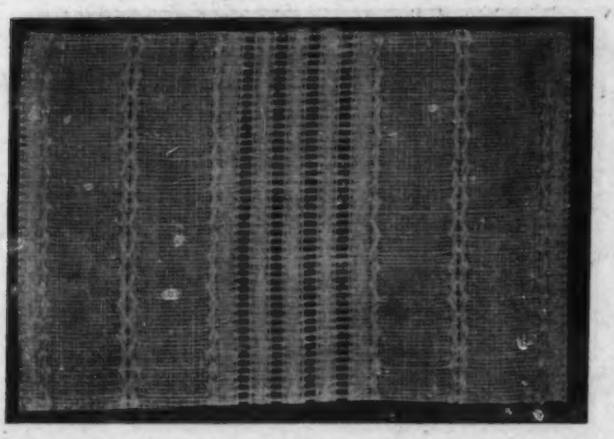


FIG. 45. SAMPLE CONTAINING HEMSTITCH AND NET LENOS.

noticed: (1). How many crossing ends work differently from each other. This will show how many sets of doup are required. (2). How many standard harnesses are required for each crossing end. (3). Ascertain the full number of harness shafts required, then mark on design paper the lines of squares required for each weave and in their order.

To apply these points:

It will be noticed that there are two separate and distinct lenos in the sample. The section marked A is "net" leno with a plain cloth ground. The section marked B is "hemstitch" leno bordering a plain stripe with two empty dents in the reed between each leno stripe. In the net leno there is one crossing end and two double standard ends—two ends weaving together as one—therefore the number of harness shafts required for this leno will be five; one for doup, one for doup harness, two for standard, and one for crossing.

In the hemstitch leno there is one crossing end and one standard end, therefore the number of harness shafts required will be four; one for doup, one for doup harness, one for standard, and one for crossing.

It should be noted that in a hemstitch leno only one standard harness is required. In a net leno, with few exceptions, the standard ends weave plain, either wholly or in part and two harness shafts are used.

In the sample shown it would seem that the crossing ends in the net leno do not all work the same and would require more than one set of doups. It will be noticed, however, that the two crossing ends in the middle of the stripe which form a diamond are weaving exactly the same, but a right hand doup is used on one side and a left hand doup on the other. When the doup is raised, it causes the crossing ends to be raised on opposite sides, and when the doup harness is raised, they are raised together; and in this way the diamond is formed.

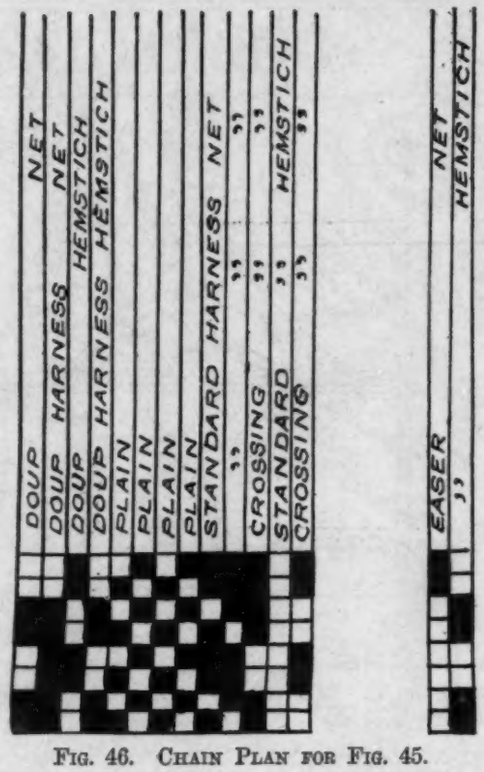


FIG. 46. CHAIN PLAN FOR FIG. 45.

For the plain weave in the cloth, four harness shafts will be used. This will give a total of 13 harness shafts; four for hemstitch, five for net, and four for plain.

The next point is to mark on design paper the order in which the harness shafts have to be arranged. Then the working of each weave should be marked down separately under its own set of harnesses. This has been done in Fig. 46 which clearly shows the method of procedure.

Fig. 47 is the drawing-in draft and reed plan. The solid squares represent ends from bottom beam for plain and standard, the dots represent the crossing ends for net leno taken from the top beam; the crosses represent ends for hemstitch leno taken from the middle beam. Figures in reed plan indicate empty dents.

There are a few other points which must be kept in mind: First, the doup must always be in front of doup harness; second, the crossing harness must always be *behind* the standard harness; third, when more than one set of doups are used, each set should be kept together, that is, the crossing and standard harnesses should be together and not all crossing harness together, then all standard. This, however, is not compulsory, but the writer's experience is that the best results are obtained by keeping the harnesses of each set together.

(To be Continued.)

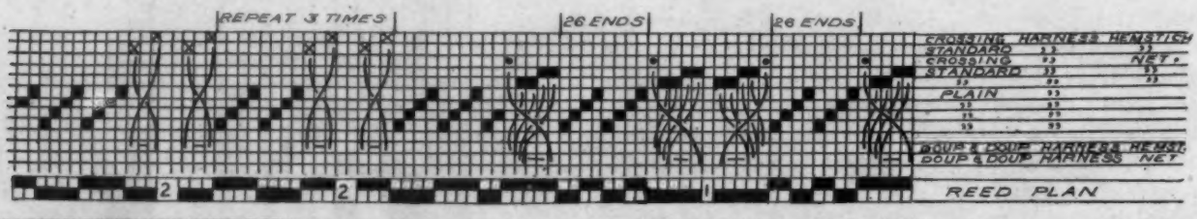


FIG. 47. DRAWING-IN DRAFT AND REED PLAN FOR SAMPLE FIG. 45.

THE MANUFACTURE OF ARTIFICIAL SILK FROM COTTON.

DESCRIPTION OF CHARDONNET PROCESS—THE LEHNER PROCESS—PAUL FREMERY'S METHOD, AND OTHERS.

(*Contributed Exclusively to* COTTON.)

BY H. R. CARTER.

PART II.

Practically all artificial silks are produced from a solution of pure cellulose by causing the solution to be forced by pressure through capillary tubes into a medium which effects the decomposition of the solution and produces a solidification of the cellulose, such medium being generally a liquid. The diameter of the filament and consequently its degree of fineness is mainly determined by the diameter of the discharge opening but by the use of suitable apparatus may be further reduced in size by the action of gravity as the filament falls through a slow acting precipitating or solidifying medium, or else drawn out by a mechanical draft produced by the winding-up drum. Drawing out can only be successfully accomplished if a slowly acting precipitating liquid is used. Drawn out by the gravity method, filaments rich in metal and consequently of high specific gravity exercise a strong downward pull; and therefore if the height through which they descend is sufficient, they will produce a reduction in the section of the upper part of the filament. The drawing out of filaments of artificial silk in a slow precipitating medium can be aided by imparting to the precipitating liquid a considerable motion in the direction of the issue of the filament so as to cause it to draw the formed filament along with it.

In carrying out the process practically it is of advantage to cause the slowly acting and rapidly acting precipitating liquids to operate in superposed layers upon the filaments, so that the issuing filaments first pass through the slow acting precipitating liquid, where they are drawn out, and then caused to pass through the rapidly acting precipitant for the purpose of completing the requisite decomposition of the solvent.

If a number of discharge openings are placed closely side by side, the drawn out filaments will, on issuing from the bath, unite on account of their attraction of cohesion, forming a thread composed of many strands which do not stick together, but which may be subsequently twisted together, producing a uniform and strong thread. Working in this way, should one of the filaments break, the fractured part will be carried along by adhesion to the other filaments, without causing any interruption of the operation.

THE CHARDONNET PROCESS.

Briefly stated, the method of carrying out the Chardonnet process for the manufacture of artificial silk is as follows: Cellulose, through treatment with sulphuric and nitric acids is converted into soluble nitro-cellulose which is then dissolved in a mixture of equal parts of alcohol and ether, forming a viscid liquid called collodion; calcium chloride being also sometimes used in order to minimize risk of fire. The purified clear solution is passed through filters and then run into a vessel fitted with a number of fine glass tubes. The vessel is closed and the solution forced out through capillary tubes under high pressure, the capillary tubes being surrounded by wider tubes through which cold water circulates. The collodion filaments are thus immediately solidified and then denitrated.

Denitration is most important, rendering the silk non-inflammable, inexplosive and insoluble. Denitration is effected by passing the filaments through luke warm water slightly acidulated, and then through a dilute solution of ammonium phosphate or other ammonium or magnesium salt, to still further diminish inflammability. The silk thread is then wound, washed and finished.

Another method of producing collodion silk differs from the preceding process in that a mixture of acetone, acetic acid and amyl-alcohol is used to dissolve the nitro-cellulose. When the collodion is pressed through the capillaries, the threads instantly solidify on contact with the air by reason of the evaporation of the acetone; and may be drawn and wound without a passage through a coagulating bath.

THE LEHNER PROCESS.

The Lehner process for preparing artificial silk is practically identical with the Chardonnet process; both employing an acid cellulose solution. Lehner discovered that the addition of sulphuric acid to Chardonnet's collodion or cellulose nitrate solution considerably lowered its viscosity and permitted the use of a 15 per cent. solution under lower pressure than that required by Chardonnet. One of Lehner's methods is to use a mixture of methyl alcohol, ether and ethyl sulphate as a solvent for the cellulose nitrate, thus obtaining an 8 per cent. solution of cellulose. In one of his patents he claims the use of a mixture of 5 parts cellulose nitrate and one part of a substance which he obtained by dissolving silk waste in ammonium copper oxide and afterwards neutralizes and precipitates with acids, washes with water and re-dissolves in acetic acid. The filaments are spun into water, turpentine, petroleum, carbon disulphide or chloroform.

METHOD OF PAUL FREMERY.

The process patented by Paul Fremery of Oberbruch consists in forcing a solution of cellulose in ammonia cupric oxide through fine tubes into dilute acetic acid which decomposes the ammonia-cupric oxide, throwing the cellulose out of solution as lustrous threads which are washed, dried and hanked.

Pauly silk or Glanzstoff is produced by forcing a solution of cellulose in cupra-ammonia through capillary tubes into a caustic lye solution to which glucose is sometimes added. The resultant silk is freed from salts by washing in water.

The Bronnert and Theile processes are very similar. Both use cotton comber waste and prepare it for solution in a similar manner. Bronnert dissolves it directly in Schweitzer's solution of cupric hydrate in ammonia, while Theile disintegrates the pure cellulose; and by intimate admixture with sulphate of copper and caustic soda gets a precipitate which when stirred in with ammonia liquor produces a similar but more concentrated solution than that obtained with the Schweitzer's reagent. In spinning, Bronnert forces his solution through capillary openings in a glass "comb" directly into sulphuric acid and collecting the filaments laps them upon a glass cylinder.

Theile forces his solution through a spinning head or cap with 40 to 50 openings, producing a like number of

filaments which are delivered into a vertical funnel in which they encounter first a weak solidifying liquid and then the stronger liquid which circulates by gravity over the edge of an inside funnel, causing a current which aids the force of gravity in elongating the filaments and in drawing them finer. Issuing from the coagulating bath of caustic lye the filaments are drawn through a dilute sulphuric acid bath and wound together upon a celluloid tube in chase form, being guided thereon by a reciprocating thread guide. The surface drum upon which the celluloid tube and chase being wound lies, dips in the acid bath and has such a surface speed that the filaments are drafted while in a soft state in the coagulating bath.

Viscose silk or Stearnofil is now usually produced from white wood pulp cellulose. This cellulose is mixed with certain quantities of caustic soda and water until the whole mass is completely dissolved. This solution of cellulose in caustic soda is then mixed with the necessary quantity of carbon bisulphide, and the mass further treated, thereby forming the sodium salt of xanthogenic acid or an aqueous solution of sodium cellulose xanthogenate. The viscose solution thus produced is of a yellow color and contains about 10 per cent. of cellulose. It is kept in hermetically sealed vessels, and should be quickly spun up. The solution is pressed through capillary tubes or a perforated plate immersed in a precipitating bath usually consisting of chloride of ammonia, sulphate of ammonia or brine. The filaments to the number of about twelve then pass over a guide pulley and are twisted together by an ingenious spinning mechanism. The thread as twisted is coiled in a box and periodically removed. Reeling, washing, souring and drying under tension follow.

Artificial horse hair is produced in a similar manner to artificial silk from the same solution or from a solution of cellulose in zinc chloride. The apertures through which the solution is forced are of course of comparatively large diameter and single or in pairs, the hair produced from a single filament being more brittle than a compound hair.

(*To be Continued.*)

DETAILS OF A FINE SPINNING MULE.

SETTING-UP AND DRAWING-UP MOTIONS.

(*Contributed exclusively to* COTTON.)

BY WM. SCOTT TAGGART, M. I. MECH. E.

PART II.

An elevation, drawn to scale, of the headstock of the Threlfall mule is shown in Fig. 6. From it we see the relative position of the various elements. The gearing plan in Fig. 1 was a conventional drawing simply to illustrate all the wheel work, etc., by spreading them out on one plane. Fig. 6 will indicate their actual position on the mule. We can now see clearly how the spindles are driven by the two rim pulleys G and X. When the main strap is on the fast pulley 4, we have the rim pulley G driving the spindles, at the same time pulleys X and 2 are being driven through the rim band. When the strap is moved to pulley 2, the rim pulley X drives the spindles, and of course the rim pulley G, wheel A, pulley 5 and pulley 4 will be driven through X. Only the spindle driving, however, is in each case effective because free wheels and catch boxes, as other drawings will show, render the movement inoperative in other directions.

SETTING-ON AND DRAWING-UP MOTIONS.

Fig. 7 is a view of the left hand side of the headstock. The detail mechanism at the front of the headstock and to the right of the drawing is enlarged and shown in Fig. 7, so that it may be more clearly be understood.

The main driving belt, it will be noted, is supposed to be on the loose pulley B in Fig. 7. The drawing-up strap is presumed to be on the fast pulley D as shown by the position of the belt shifter K; consequently the carriage is moving inwardly. The gearing from pulley D to the scroll shaft is simply through the bevel wheels shown, and no cone clutch is used, thus avoiding the jerky effect on the carriage often noticed in mules where a cone clutch is em-

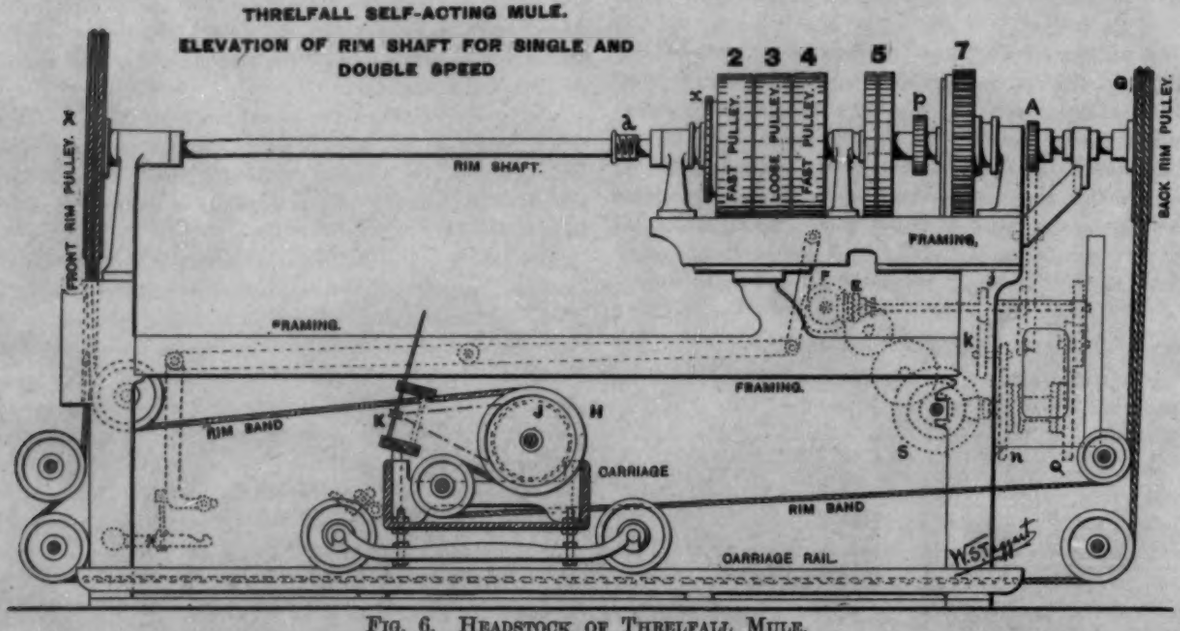


FIG. 6. HEADSTOCK OF THRELFALL MULE.

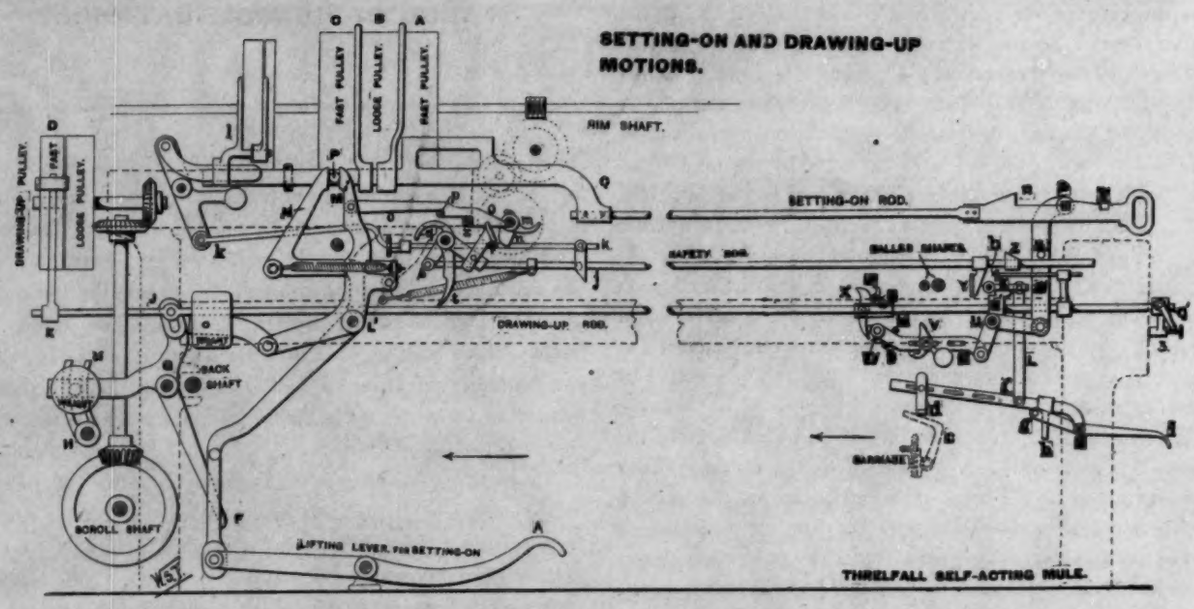


FIG. 7. DETAILS OF THE HEADSTOCK.

ployed; the advantage of this will be obvious especially for very fine yarn.

During the winding operation, which is now taking place, the setting-on rod is locked in position by a square stud the arm "a" fitting into a recess at S. As the carriage is completing the inward run, a projection on the square presses against the gun lever at F. This lever F is centered at G and has two arms at its upper end. The upper arm is slotted and fits over a pin at J on the drawing-up rod, whilst the other arm carries a weight which is guided by a slotted fork lever centered at H. The necessity for this forked guide will be explained later. It will be seen that when the carriage pushes F, the drawing-up rod will be moved in the opposite direction and consequently the strap will be moved by the fork K from the fast pulley D to the loose drawing-up pulley, and this of course will stop the mule on the completion of the inward run.

At this moment the faller leg is unlocked from the shaper bowl guide and the faller wires move free of the yarn ready for the outward run. Before the outward run can take place, the main driving belt must be moved from the loose pulley B to the fast pulley C. This operation is performed as follows: It will be seen from the drawing Fig. 7, that the setting-on rod Q which carries the strap fork is locked at S by a square stud on a vertical link B. This link B is coupled by a bell crank lever centered at U to a sliding arm E. On the drawing-up rod is fixed a boss M which carries a tumbler X. The lower end of this tumbler bears against a stud W on the outer end of the sliding arm E. When the drawing-up rod is moved forward, that is, in a right hand direction, through the gun lever F, the tumbler X pushes the arm E forward and through the bell crank lever centered at U, raises the vertical arm B which in turn lifts the square stud S out of the recess and so unlocks the setting-on rod.

Owing to the end W of the arm E sliding in an inclined guide F, the stud W will move away from the tumbler X, and so enable the tumbler to pass over it if necessary. The drawing-up rod also carries a stop E, having a cut out recess at the left hand side. Resting on this stop is a link K centered as shown; the other end of the link K has an arm L attached to it whose lower end is centered at "f" on a lever whose fulcrum is at "e." This latter lever carries an adjustable bracket "d."

It will now be seen that when the drawing-up rod is moved forward (right hand direction) sufficiently far, the link K will fall into the recess on the stop E, and thus lock the drawing-up rod. The unlocking of this rod is also clearly shown in the drawing, but of course it only takes place after the backing off, when the locking of the faller leg actuates the lever "c" which raises the bracket "d" and so lifts the link K which frees the drawing-up rod. Up to this point we have shown how the setting-on rod is unlocked and in a position to be moved so as to transfer the belt from pulley B to pulley C. We also have seen how the drawing-up rod is locked and the belt kept on the loose pulley at D.

Now referring to Fig. 7, it will be observed that the setting-on rod Q carries a pin or stud P which is held between two levers M^1 and N, both levers being on the one center L^1 and coupled by means of a strong spring as shown. An extension of the lever M^1 carries a weight, and this weight tends to pull over the end M^1 and so force the setting-on rod backwardly. This, however, cannot happen until the link O is unlocked from the stud "x" by the cam "m." When lever M^1 is free, it forces the setting-on rod, by means of the pin P, backwardly and so moves the belt from B to C. The recess T on the setting-on rod is by this means brought under the stud S which falls into it and so locks the rod.

As before explained, the movement of the gun lever F centered at G raises the weight which is guided by the forked lever centered at H. This weight has a squared center pin which is raised high enough to permit the fork to move on one side and thus bring the prong "w" under the center stud of the weight. This prevents the weight from falling and it also further locks the drawing-up rod.

At this point it may also be explained that the movement of the lever M^1 in forcing the belt from B to C, has

also through its lower extension raised the end A^1 of the lifting lever. As the carriage moves outwardly a projection bowl on the carriage depresses the end A^1 which through the levers shown moves M^1 away from the pin P. The pin P, however, prevents lever N from any movement because the setting-on rod is locked at T by the stud S, so that the strong spring between M^1 and N is put into tension. When the moment arrives for shifting the belt from the single speed pulley C to the double speed pulley A, the stud S is lifted from the recess at T, and the setting-on rod, being now free, is shot forward (in a right hand direction) by the spring pulling on the lever N, until the square stud S stops its movement when the projection R comes against it.

The method of lifting the link B and stud S from the recess T is as follows: A projection on the carriage comes into contact with the tumbler V, which moves the slide E forward and thus raises the stud B. The inclined slide F causes the tumbler V to descend until the projection passes over it. Both tumblers X and V are free to swing in one direction. The tumbler X is fitted with an interesting mechanical device. As shown, its upper part rests against a swivel stop centered at N on the boss M. Any pressure at the lower end of X against W causes the former to act as a rigid element and it will therefore force W forward in a right hand direction. If for any purpose we do not desire the change from loose to fast driving pulleys to take place, the swivel P is turned over out of the way of tumbler X and then the latter is free to swing in both directions without affecting the stud W. Since the stud is not raised at S, no movement of the setting-on rod takes place; the mule therefore stops dead at the beam.

During the outward motion of the carriage the drawing-up rod is locked on the stud E^1. If it is desired to stop the mule on the completion of the run-out the swivel Q^1 on the outer end of the drawing-up rod is turned over against the frame end. There is, of course, a space between 3 and the framing which permits this to be done when spinning. The usual changes take place and the drawing-up rod is unlocked by raising the link K, but the rod cannot return because the swivel Q^1 prevents it; and since the drawing-up belt is not moved to the fast pulley D, no inward movement of the carriage can take place.

There are one or two points that may still be mentioned in connection, the mechanism of the mule. For instance, if the carriage, from any cause, does not stop dead at the correct point and so misses the catch, the faller would come in contact with the finger Y. This would move the safety rod and cause the lever "r" to lift the twist lever "o," thus allowing the setting-on rod to move backwardly and put the belt on the loose pulley B.

The inclined boss Z on the safety rod is used for raising the lever B and square stud S when single speed is being used only. By passing under the round projection "a" the raising of B is easily effected. If necessary the drawing-up rod can also be released or unlocked by pressing on the knee lever "i."

VALUE OF HUMIDIFICATION.

BY A. A. B.

Humidification is of vast importance in the manufacture of cotton, especially in spinning the yarn. Yarn spun in very dry air is usually of the poorest quality. The dry air is charged with electricity generated by the friction of the machinery. This dry charged air causes the fibers to separate and become fuzzy or bearded. The result is bunchy, loose looking yarn of little strength. With a relative humidity of from 65 to 75, this weak, loose, bunchy product is no longer made but in its place a strong, smooth, compact looking yarn results.

In regard to the value of humidifying after conditioning by means of sizing, this latter treatment lays the fibers to a certain extent, but drying the yarn before it passes to the beam takes out the natural moisture. This causes the yarn to lose its elasticity and brightness so absolutely necessary to a high grade yarn. Conditioning by humidification restores the luster, lays the fiber, and increases the breaking strength.

After a large number of experiments in spinning under various humidities, it has been proven that as the humidity increases up to a certain point the number of broken ends decreases. This was true with the humidity between 65 and 80, although the best results were obtained with the humidity around 70. This test also proved that the larger the amount of humidity the greater the breaking strength of the yarn. In regard to the spinning frames it has been found that better work is turned out when the air is warm and damp than when dry; also the amount of fly collected on the frame is greatly diminished.

Let us consider humidity relative to the operatives: When the air is dry and charged with electricity most workers become slow and stupid in their movements, apparently lacking energy. If the humidity is increased to about 70, they lose this sluggish manner, and the result is more work of better quality. Care must be taken not to have the humidity much over 70 for the effect will be just as bad as with not enough. The dampness will settle on the machinery making the work sticky and also making the operative miserable.

With proper up-to-date methods of mill humidification, the following conclusions may be drawn: Increase of humidity decreases the amount of bunchy bearded yarn; increases the smoothness and appearance of yarn; decreases the number of broken ends; increases breaking strength; increases the efficiency of the spinning frame; decreases the amount of fly collected on the frame; increases the efficiency and satisfaction of workers.

Conditioning by humidification restores luster and elasticity after sizing and drying of the yarn.

The best results are obtained with a relative humidity of about 70.

KNITTING

A STUDY OF FLAT KNITTING MACHINES.

ADDITIONAL TYPES OF CAM ARRANGEMENTS—JACQUARD KNITTING.

(*Contributed Exclusively to* COTTON.)

BY H. K.

PART II.

The center or upthrow cams are the most variable in style. The wing cams are in nearly all cases practically the same. The wing cams regulate the length of loop.

Fig. 7 shows a style of cam arrangement suitable for circular work or rib work. Cams C and D are spring controlled and have two positions, so as to allow the needles to knit in either direction or in both directions. They may be placed in a position so that the needles do not rise to knit at all. In Fig. 7 cam C is shown against the wing A. This allows the needles to knit when the cam set is traveling in a right hand direction; and when moving in a left hand direction the needles pass through between C and E. The needle butts force the cam D upwardly and when the latter has passed the needles, it resumes its previous position.

Fig. 8 is another type of cam arrangement suitable for circular or rib work. Upthrow cams C and D can be raised or lowered independent of each other by small levers, similar to lever shown in Fig. 6 (November issue.) The cams are beveled off until the inside edge is on the same level as the cam-plate. If C is raised and D is lowered, the needles rise to knit when the cam set is traveling to the right and when it moves to the left the needle butts force D into the cam plate and pass over it. This cam D resumes its knitting position when the needles are passed. When using cams as shown in Figs. 7 and 8, the carriage only requires to travel the knitting distance, whereas in using stop cams the carriage requires to travel the full distance of the width of the machine when knitting circular work.

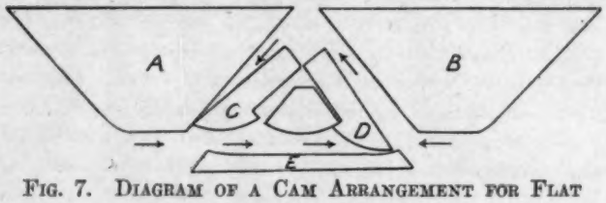


FIG. 7. DIAGRAM OF A CAM ARRANGEMENT FOR FLAT MACHINES.

JACQUARD KNITTING.

In machines producing Jacquard and fancy nop designs, the cams are more numerous and more complicated.

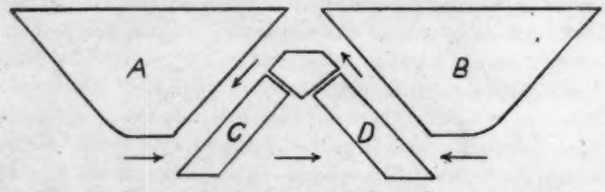


FIG. 8. DIAGRAM OF ANOTHER CAM ARRANGEMENT.

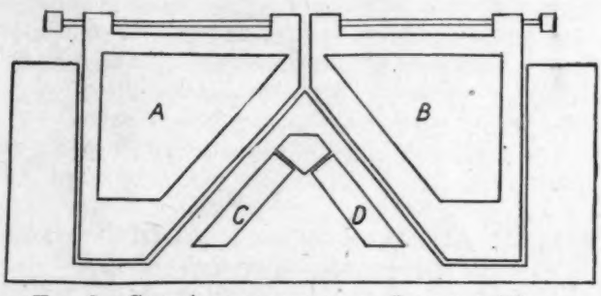
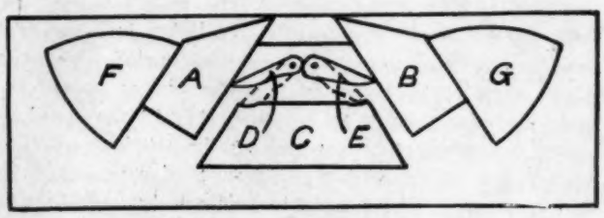


FIG. 9. CAM ARRANGEMENT FOR JACQUARD WORK.

Fig. 9 illustrates a style of cam used in a Jacquard machine. The needles are of the ordinary short shank type, but are supplemented by jacks. The jacks project through the needle beds and occupy the same position as the needle springs in the ordinary flat machine. When knitting Jacquard work, the center cams are raised out of action. The needles are raised high enough by the jacks to allow the old loops to be down over the latches of the needles. The cards of the pattern operate the back needles while the front needles are operated by a 1 and 1 comb arrangement which has a sidewise movement over one needle space. The odd needles are knitted at one course while the even needles knit at the second course. This is necessary to prevent the back of the fabric from being too stiff and inelastic. The yarn guides may be either two, three, or four in number according to the pattern desired. The system of cams shown in Figs. 10 and 11 is used on machines which are adapted to the knitting of raised designs. A double butted needle is used in both needle beds.

The cams in Fig. 10 consist of two adjustable knitting cams A and B, a movable raising cam C, and two adjustable wing cams D and E. The top of the cam C is the tucking level, so that in making tuck work, one or both of the wing cams D and E occupy the positions shown by dotted lines; whilst to knit, the needles must travel over the top of the wing cams which they must necessarily be in the positions shown in dotted lines. If the needles are not required to knit at all, then the cam C can be raised into the cam plate by a small lever handle.

Cams F and G are called helping or knocking over cams. These cams are brought into use to draw over the necessary accumulation of loops in nop and tuck work.



FIGS. 10 and 11. CAM SYSTEM FOR RAISED DESIGNS.

The bottom set of cams in Fig. 11 consists of two center cams H and I. Cam I raises the needles selected by the Jacquard to a tucking position, whilst H raises them to a knitting position. If the cam C is in position, however, the cam I would be rendered useless, whilst if the wing cams D and E were in knitting position, the position of the cam I would be of no consideration. The cams H and I, like C are controlled from lever handles placed on the outside of the carriage, and as explained, act only on those needles which have been brought into position by the Jacquard.

STITCH ADJUSTMENT ON LOOP WHEEL KNITTING MACHINES.

(*Contributed exclusively to* COTTON.)

BY ERNEST TOMPKINS.

Uniformity in the length of stitch is of much importance in the production of good knitting, so much so that in the early days of the loop wheel machine only one feed was used, since it was considered impossible to adjust two feeds alike. The demand for greater production soon outweighed this desire for nicety to the extent of introducing multiple feeds, and after that disinclination to spend the time required to uniformly adjust these feeds led to such further abandonment of the old idealism that it is largely out of sight today—especially in the manufacture of cheap work. This is unfortunate, since even if the stock and the yarn must be inferior the adjustment need not be so—rather it should be the reverse since careful adjustment partially makes up for these other inferiorities.

Stop at the underwear bargain counter and examine a marked down 25-cent so-called "bal" shirt. It may be best examined for this purpose by viewing one thickness so that the light shines through it. Frequently one course will transmit more light than the others. If this light portion is of quite short length it may be due to unevenness in the yarn, but if it continues all around the garment, repeating itself say seven courses below, then the fabric was made on a seven feed machine and at that particular feed the yarn was light or the sinker bur was set too deep. Since it is easier to blame the trouble on the yarn than to measure the stitch the yarn is frequently made the scapegoat for poor adjustment.

Intelligent adjustment is not to be expected without an understanding of the causes which affect it. Some of these causes are: Untrueness of cylinder or looseness on stem, causing the needles to enter the sinker bur at different depths; misalignment of needles, having the same effect; variation in speed, bending the needles inward toward the center, more or less according as the speed is higher or lower, and thus making the stitch shorter or longer; lack of uniformity in yarn tension, causing the feed having the more tension to knit a tighter stitch; and non-uniformity of fit of the burs in the needles, causing a difference in the friction on the yarn as it enters the needles so that the tighter is the bur the shorter is the stitch.

It is generally supposed that stitch adjustment is done principally by turning the adjusting screw on the bur shaft thus moving the bur in or out of the needles. In reality it is modified more or less by the causes above mentioned, which may be summed up as causes which move the needles in or out of the bur.

MEASURING THE STITCH.

Probably the most important method of measuring the stitch is that one which apportions a fixed length of yarn to a fixed number of needles. A wire one foot in length is used to measure one foot of yarn before it runs into the guide. The marks on the yarn are generally made with the thumb and index finger stained with black oil from the gearing of the machine. The cylinder is then turned slowly by hand until the marks appear in the stitches on the needles. The number of needles between the marks is counted, which number is the number of needles per one foot of yarn, a relation desirable to know since it is necessary for determining the weight of the cloth from the count of the yarn, which may be done by substituting in the formula:

$$\frac{\text{Wales per inch} \times \text{Courses per inch}}{1.94 \times \text{Cotton No. of Yarn} \times \text{Stitches per foot}} = \text{Wt. per sq. yd.}$$

After one feed is properly adjusted by this method the other feeds are adjusted to match by marking each yarn one foot from the guide, turning the cylinder until the spot at the adjusted feed has reached the guide, and then turning in or out the other sinkers, according as their yarn marks are not up to the guide or are passed through the eye. A second trial at least is necessary to prove the adjustment. The stitches need not be recounted since the adjustment of all except the first feed is merely comparative.

If the cylinder and needle line were true this method of measuring the stitch would be fairly reliable, but in no case are they absolutely true so that, theoretically, errors are introduced and in many cases the untrueness is sufficient to cause apparent unevenness in the cloth. Suppose that a smash has occurred on the machine in question and that a couple of plates of needles have been put out of alignment, most of them bent inward for instance. If the foot of measured yarn is knit on this section the number of stitches per one foot of yarn will show too high since the stitches in that section will average shorter than those where the needles are properly aligned. For practical adjustment of the sinkers this difficulty may be at least partially overcome by counting the stitches per foot at each feed and on one and the same section of needles. To carry this out, the ratchet side of the take-up may be placed directly above each sinker at the time of measuring the yarn at that sinker.

This method of counting on the same section of needles compensates similarly for a fixed untrueness in the cylinder, i. e., one which revolves with the cylinder; but it will not compensate for one which has no regular period, such as is caused by a loose stem, and it is doubtful if any practical method will, and still give the stitches per foot of yarn. After the stitches have been evened and the cylinder is driven by power the number of stitches per foot of yarn will be slightly increased owing to the bending inward of the needles due to the sinking of the stitch. The amount of this increase is another question on which light is needed, and it is to be hoped that some of the knitting schools will investigate and report on this as well as on a number of others of interest to knitters. Casual

observations indicate that the increase in the number of stitches due to normal speed may be about 5 per cent. for average flat work conditions. After the machine is in operation a loose or tight course due to wrong size yarn, unequal tension, or a tight bur may be detected and located by watching the cloth as it runs over the cast-offs.

When the cylinder is revolving at speed the cross-bars of the stitches appear like fine screw threads rising from the needles, and at the cast-offs this appearance is most marked, so that a slight difference in the courses is evident. By following the cast-offs back contrary to the cylinders direction or rotation the feed may be located from which the loose or tight course is rising. If transferring the bobbin from this feed to the next likewise transfers the defective course, then that bobbin is off of the yarn count; but if not, then the tension at that feed may be excessive, the bur may be too tight, or the stitch may not have been properly evened in the first place. The latter is frequently the case when a short measure, such as six inches, is used instead of a foot, since there is always some error due to inability to count accurately, so that the percentage of this error is increased by using a decreased length.

STITCH MEASUREMENT WITH A COURSE MEASURE.

Probably the most convenient method of measuring the stitch is by means of a course measure. This is a strip of sheet metal bent near the middle about 45 degrees out of line and having a piece of wire soldered across the outside near the bend and one inch from the long end. The short end is the handle for holding the measure against the cloth with the wire resting on the heads of the needles for support. Since the measuring end is one inch in length the number of courses covered by it is the number of courses per inch. The marking is done by pushing the cloth down between two feeds and rubbing a pencil across the row of stitches on the needle shanks. The cylinder is started with one feed. Suppose that the fabric is to be knit 42 courses to the inch. The mark is made, the cylinder is revolved 42 times and the course measure is applied. If the mark has not reached the end of the measure or has passed it, then the stitch is, respectively, too short or too long. The sinker is accordingly let in or drawn out and the test is repeated until the mark comes to the end of the measure. Then another feed is put in operation, the needle course is marked and 21 revolutions of the cylinder are made to obtain 42 courses since there are now two feeds in operation. The needed adjustment, if any, is made at the new feed since it is known that the first one is properly adjusted. These operations are continued until all of the feeds are running and turning off the fabric with 42 courses per inch. The measure should always be applied at the same place on the cylinder, say under the ratchet end of the take-up since the tension is least under the ends of the take-up, and although either end would do, it is well to designate a particular end to avoid confusion.

Measuring the fabric by the number of courses does not afford a means of determining the length of yarn used. It does, however, eliminate inaccuracies due to untrue cylinders, loose stems, and misaligned needles, since the number of courses is not affected thereby. Consequently, this method of measuring the stitch is applicable where the number of stitches per foot is not. When more than usual refinement is desired, each feed should be separately adjusted to give the desired number of courses, since when several feeds are running the last one added gets the poorest test. For instance, in the case of the 6 feeds mentioned just above, the first feed was tested for 42 courses and an error in measurement of one course would represent an error in adjustment of 1/42, but the sixth feed supplied only 7 courses of the 42 measured so that for the sixth feed an error in measurement of 1 course would represent an error in adjustment of 1/7.

The stitch glass method of measurement is the same as the one just described except that the courses per unit of length are separately counted under a magnifying glass instead of by revolutions of the cylinder. The difference is merely in the means of applying the measure, which means is less convenient since it involves a strain on the eye, necessitates good light, and is likely to be less accurate owing to the use of short units of length, such as half-inch or quarter-inch apertures.

For experimental and scientific purposes the methods of stitch measurement should be more accurate than the practical methods just described. The most desirable plan is that one which gives the number of stitches per unit length of yarn (stitches per foot of yarn) since this is an absolute measure whereas courses per inch afford only a relative one. When the measurement is desired at the machine one feed is used at a time and the bobbin is moved away from the machine to a distance more than the length of yarn in one course. A spot on the yarn is marked, its position is located, one complete revolution of the cylinder is made and the distance moved by the spot is measured. The number of needles in the cylinder divided by the number of feet moved by the spot on the yarn gives the number of stitches per foot of yarn, without error from misaligned needles or from untrueness of the cylinder, since one complete revolution eliminates these errors.

The error due to the speed of the machine is not obviated by the above method, and probably can not be by any method requiring measurement before the fabric is knit. To eliminate this, take a one feed tube of cloth, place it so that the yarn may be raveled onto a yarn reel, mark along one wale with a blue pencil, turn the reel and note the length of yarn between the blue marks. This is the length of yarn in one course, which divided into the number of needles in the cylinder gives the actual number of needles per one foot of yarn. Courses at succeeding sections of the fabric should be reeled in order to avoid mistaken observations and to get a fair average.

New Process for Waste Silk.

The manager of the Fuji Gassed Yarn Co., at Yokohama, has patented a process with regard to waste silk. The new process consists in boiling the waste silk while it is still wet, instead of drying it first. At present the silk-reeling establishments dry their waste, and sell it either for consumption in Japan or for export in the shape of dry waste. This dry waste has then to be boiled. Under the new system the boiling of the silk will be done by the reelers themselves before the waste has had time to dry. It is estimated that in this way 70 pounds of boiled dry waste will be obtained for every 100 pounds of ordinary dry waste, but that the former will produce 35 pounds of peigne (dressed silk) as compared with only 30 pounds from the latter, and the quality under the system will, it is stated, be much better.

DYEING, BLEACHING AND FINISHING.

DRYING ROOM OPERATIONS IN THE TEXTILE INDUSTRY.

(*Contributed Exclusively to* COTTON.)

BY JOS. H. HART.

The writer has examined drying rooms in a wide variety of installations in a number of the textile industries and is prepared to make the assertion that scarcely one in ten of these plants are efficiently constructed and operated, judged by the standards which have come into existence as a result of comparatively recent developments in that branch of engineering which has to do with the science of moisture evaporation from commercial products. In probably no branch of industrial activity does the question of moisture enter to such an extent as in the various textile developments. In some phases moisture producers or humidifiers as they are called are absolutely essential for the efficient operation of the plant. In others moisture removers or drying rooms are equally so and much delay and considerable inconvenience and expense are encountered on account of the fact that these devices do not operate with the efficiency and capacity necessary under certain conditions. Few mill men who have occasion to use drying rooms have any conception of the cost of operation of these devices, and very few, if any, have even adequate means of estimating the steam consumption in the operation of this feature.

Drying devices cover a wide category in the variety and scope of their operations. In their broader application of excess water removal, they are used in the concentration of innumerable food products, in lumber drying kilns, in laundry drying rooms and are closely connected in their final analysis of engineering features to the great number of evaporators and multiple effect condensers used in refineries of all kinds. The engineering problem encountered here has to do with the properties of saturated and unsaturated water vapor in conjunction with temperature variations and the behavior of this material when utilized in conjunction with large quantities of the ordinary atmosphere. Textile dryers operate under a large variety of conditions and employ what appear as radically different but closely related engineering principles. Thus the use of superheated steam for drying purposes has an efficiency which is unquestioned. It is unfortunate that this principle is not utilized more widely than it is at the present time, as it presents possibilities if properly developed, in regard to drying efficiency which cannot be surpassed by any of the other devices now utilized. It makes use of the tendency of an unsaturated vapor to become saturated when in contact with its own liquid at a temperature where this tendency is many times as strong as it is at temperatures ordinarily used. It is in addition essentially direct in its action whereas all other types are indirect and depend for their activity upon transfer of heat from banks of steam piping.

Many drying rooms in this branch resemble in some ways the ordinary drying rooms as used in the average laundry, only upon a considerably larger scale. The drying room is more or less insulated to retain the heat produced and the heat is furnished from banks of steam pipe, placed often according to the judgment of the individual who has had experience only in the installation of a few plants. Generally no systematic attempt at circulation is undertaken and the efficiency of such a device as judged by what can be obtained in this field with little trouble is extremely low. The phase of drying which will be taken up in this article has to do with that type which is known as "moist drying." Remarkable economies in steam consumption have been obtained in such installations. An 80 per cent. saving in steam consumption is not unusual and the type is obtained readily by slight modifications in many existing plants. In this type of drying device the air or moisture carrying agent is used continuously, going through a complete and regular cycle. The air is heated by contact with the steam coils, preferably in a separate chamber, whereby its moisture carrying capacity is very greatly increased and it is then brought in contact, as intimately as possible, with the material to be dried where it takes up large quantities of moisture. It is then driven on in its path, by either forced or natural draft, to the condenser, which consists generally of banks of pipes, through which cold water is flowing. The air is chilled here and a large portion of the moisture condensed, after which the air still saturated, but at a low temperature enters the steam coils, where it becomes so hot without access to moisture that it rapidly becomes unsaturated and possesses a strong avidity for water, at which point it again enters the drying chamber and resumes its duty of moisture removal. The advantages of this type are unquestioned. The question of dirt present in the outside atmosphere does not enter at all as a problem. The temperature and humidity of the atmosphere, variable under normal conditions, have no effect on the efficiency or capacity of the device. In lumber drying kilns and in many laundry drying rooms this type is becoming standard. Results are accurate and to be depended upon, in regard of capacity, time of operation, and character of work. The increased efficiency of the device in regard to steam consumption has been mentioned and even greater possibilities in this line are possible. This is especially the case in this development since the duty to be performed here is of a rather heavy type, large quantities of water being required to be moved in comparison to that in other developments and the possibilities of economy being much greater.

The theory of this device is in a chaotic state, at least from the point of view of the average layman interested in this development. The behavior of saturated and unsaturated water vapor under varying conditions of temperature, pressure, volume and density has taxed the capability of steam engineers and steam engine designers to the uttermost. When the behavior of the material is complicated by the presence of air in large quantities with its variations in temperature, volume, pressure and density the results form an exceedingly difficult proposition on which to develop satisfactory theories. Again the data from which to work exist in widely different forms and very scattered sources, and many transfers of heat itself occur so that the whole theory of thermodynamics must be available for even a basic understanding of the subject. In a general way it can be said that the drying capabilities vary greatly with the temperature, and that a slight variation in temperature when the temperature is high, effects the drying capability

as much as a variation in temperature ten times as great at a lower temperature. A distinct drop in temperature occurs in this device as soon as the heated air comes in contact with the moisture in the material to be dried. The effect is analogous to dropping of red hot coal in a pail of water. A portion of the heat is used in evaporating some water and this is the case whenever water is changed to vapor. Since the drying capacity depends upon the temperature and the temperature falls during the act of drying, the difficulty of predetermining results can be readily seen. The theory of the drying room can be likened in many respects to that of a steam engine or innumerable other heat processes. Like it heat is constantly going through the device, in at the steam source and out at the condenser. The efficiency of the device, like that of the others, is the ratio of the heat used for the purpose desired to the total heat used in the device. Since here, the heat used effectively is that required for the evaporation of the water in the material to be dried, and the total heat is the heat which is in the steam entering the drying coils, the efficiency is extremely low. This has been increased recently in some cases, it is said, but at best only a few per cent., and the possibility of improvement is great. Of the heat which goes into the steam coils, a large portion comes back in the water of condensation. Of the difference which gets into the drying agent, a large amount goes straight through without effect and is lost in the condenser. The higher the temperature of the condenser the less apparently is the heat lost here, but more moisture goes back to the drying coils where it must be re-heated and the heat carrying capacity of moisture is excessive and great quantities are carried through the drying room to the condenser on this account. A low temperature in the condenser removes most of the moisture and limits the heat capacity of the drying agent and increases its drying capacity, but the heat loss is excessive here on account of the excessive drop in temperature. No reliable data of temperatures at which to carry condensers is available, since temperatures which give best results with one type of kiln do not do so for another. The construction of the drying room, the size and capacity of the steam coils and condenser pipes and the rate of flow through the drying room together with the distribution of the material to be dried are all factors which interact in their effect on temperature and saturation to such an extent that in the majority of cases each plant must be considered as an individual case and best conditions for operation determined after a detailed study of all other features.

In construction the best of drying rooms follow certain well defined principles to-day. The modern drying room is extremely long in comparison to its width and height. The more closely it resembles a tube the better. The air heated by the steam pipes enters at one end, travels through the tube performing its drying function and leaves at the other end, where it enters the condenser. In order to minimize the length of air travel, it is a good plan to put both the heating chamber filled with steam piping and the cooling chamber filled with condenser piping in conjunction directly under the drying chamber. It is equally best to have forced draft. Although with this arrangement, natural draft is possible and fairly effective, greater capacity, saving in time and greater reliability and uniformity in results can be obtained with forced draft. The entrance from the steam chambers to the drying room should be as high as possible and the walls and ceilings should be so sloped as to assist rather than retard the flow of air, and every attempt should be made to eliminate recesses or places where the air would tend to remain stagnant or produce eddies. In the same way the connection between the drying room and the condenser room should be as low in the drying room and as high in the condenser room as possible for the same reasons. The connection between the condenser room and the steam heating room should be as low as possible. The object to be attained throughout this design is to get perfect and complete circulation, as rapid and thorough as possible. The air will be retarded quite sufficiently by the material in the drying room undergoing drying to prevent any possibility of too rapid circulation. If this unusual condition should occur it can be easily remedied by choking up the drying room with more material or operating at a faster rate, and then shutting down, if the excess duty is not necessary. The principle back of this construction is the tendency of warm air to rise and of cold air to fall on account of variations in density.

In the best types of dryers the material to be dried also travels in the drying room, either continuously or intermittently in batches. For some time there has been a question among engineering circles as to which is the best direction of travel for the drying material. It can enter either at the high temperature unsaturated end of the drying room, coming out at the colder, almost saturated end above the condenser, or it can travel in the opposite direction. If it enters at the steam end of the drying room, the wettest material comes into immediate contact with the dryest and hottest air, and the remainder of the drying room does not perform its full duty. If the material enters at the other end, the moisture is gradually removed throughout the entire path of the material, the dryest and hottest air coming in contact with the material in its dryest and hottest condition so far in the drying room and thus putting the last finishing touches to the material before its removal There is no need of so long a drying room if the moist material enters at the heated end. However, the air is hotter here and capable of absorbing more moisture. It does not lose its heat by radiation along its path. It may leave the drying chamber at a higher temperature than if the other procedure is followed and it may not be as completely saturated, but the claim is made that it carries more water away per pound of air used in the drying chamber at a given time. In the other procedure the claim is made that the air leaves with a higher percentage of saturation even though at a lower temperature and with less absolute moisture contents, although this latter is questioned, and that it has utilized more of the heat in evaporation than in the other case. The problem encountered here is met with in all phases of heat engineering. Even in the condenser it is present. The question as to whether best results can be attained here by allowing the cold water to enter the cooling pipes at a point where the air in contact with them is at its highest temperature, or vice-versa, for best results, is one which is general as well in all condenser installation. The same question arises in regard to efficiency in the installation of the coils of steam piping. It is believed in the majority of cases to-day that the counter flow system is the most efficient. It is the principle upon which the most efficient drying rooms, considered from both a mechanical and commercial efficiency standpoint, have been constructed. In a general way with a lack of good engineering data to go on, principles should be followed when available which have been found most satisfactory in other developments. This is the method fol-

lowed by the designers of drying rooms in their attempt to get increased efficiency and the results attained have more than justified the method followed.

A large book could be written in further exposition of the theory and practice of the drying room in this field alone. Much data is not available, but what is at hand for individual cases might or might not prove instructive, depending upon conditions to be met elsewhere. The necessity of having standard conditions or at least unchangeable ones for study is absolute. In installing such a plant larger banks of steam piping, and larger condenser capacity than those often specified or deemed sufficient should be installed to allow sufficient leeway for experiment. Valves should be used to regulate flow or amount of steam and water and thermometers should be placed in both the steam and condenser chambers and at several points in the drying room along the path of the air. A return pump or trap to measure the steam consumption should be further used. With a slight study of results under variable conditions of temperature in this system, an economy of operation, such as never before deemed possible can be readily attained.

Practical Problems Discussed by Cotton's Readers.

Discussions of Mill Problems are Solicited for this Department.

DISCUSSION OF THE WASTE PROBLEM.

BY CHAS. H. EDMONDSON.

In the January issue of COTTON, I submitted an article on "New Cotton in the Mill," giving the results of a series of tests and showing the loss in waste in the card room, and the breaking strength of the yarn in the spinning room. These tests were made merely for a comparison between new and old cotton, and of course there was no idea of accepting the resulting figures for any basis of calculation in the general run of the work.

In the November issue of COTTON, I read an article by Manager which was very interesting in more ways than one. In this article Manager says that I surely must have made an error in my test for the waste on the pickers, and that my per cent was entirely too low. He states that he went into his test in a more thorough manner than I. I don't think so. Let me state that I was very careful in my test, so careful in fact that I do not believe that there was any chance for an error. The picker room was cleaned thoroughly, together with all the machinery both before and after the test. Every lump of cotton and all waste were carefully collected and carefully weighed. About the only difference that I can see between our tests is that I used 1,000 pounds of cotton and ran it through at once, while Manager used 30 bales; and part of it must have dried out in the picker room for at least four days before being put through the machinery.

He states that I must have forgotten my lap sticks. The total weight of my finished laps was 988 pounds, and as they would average 50 pounds each in weight, that would be 20 laps. The lap sticks will average 3 pounds each, and for the 20 laps would make 60 pounds. I believe this would have had to come off the 988 pounds of cotton, had I been so careless as to neglect such an important part of the test. As there was only 26 pounds of waste collected from all the machinery, this would leave over 60 pounds to be accounted for, as I started with 1015.5 pounds of cotton. This would show more than twice as much to be accounted for as the actual waste collected and such a test as this and such figures as these would make even a novice suspicious and probably remind him of his school days when he used to juggle things together in order to arrive at some known answer. The lap sticks were taken into consideration in the test, all right.

I have never figured any bagging and ties in any picker test of mine, and I believe if Manager will consult some authoritative test on pickers and cards he will find that they have been carefully left out. They should never be taken into consideration, except when finding the total per cent of waste throughout the mill, and you cannot do this with thirty bales of cotton. All the weighings, all the cleaning of the machinery and all the collecting of the waste were done by myself alone and not left to some careless hand as Manager suggests. As stated in the article at the time, I think that the picker waste in my test is low and below the average. No doubt had I allowed the cotton to dry out in the mill before using, the per cent. of picker waste would have been at least one and one-half per cent. more. If Manager will take the green cotton under the same conditions that I did and run it through modern machinery he will find that the 2.7 per cent. is not such an impossibility after all.

Now a word or two concerning his test made in the latter part of the seventies. As this was before my day, I am not in position to describe the antiquated machinery used in those times. Surely Manager cannot compare a test made on machinery of that date where the cotton passed over grid bars few and far between and through six beaters, each one of them throwing out more or less white cotton, with a test on modern machinery. If he had carried his test on through the wooden flat, hump back card and added the ten per cent. of waste here to the ten per cent. obtained in the picker room I am sure he would feel a hesitancy in keeping these figures as standards for waste losses for modern times.

Quoting Manager, he says that 15 per cent. loss in waste from the whole mill is about what all managers allow in order to be on the safe side. Again he says: "As I make the loss in the picker room 10.71 per cent., this allows only 4 per cent. for the balance of the mill, and it ought to cover such loss."

Now I ask Manager or any one else to show me a mill on strict middling cotton where the waste on the card alone is less than 4 per cent. Let him take his 10.71 per cent. picker waste made in 1878, and to this let him add 5¼ per cent. on the card, as this is about the standard loss on the card. Now add 0.9 per cent. for the remainder of the card room, including draw frame waste, dirty roving, clearer waste and sweeps; then add 0.4 per cent. for weave room sweeps and 0.8 per cent. for clearer waste in the spinning room and spinning room sweeps. Now add 1.9 per cent. for cop waste, clean and dirty thread sized from the spinning room and weave room and 0.1 per cent. for

shearings and brusher waste in the cloth room. The 1.9 per cent. for cop waste, clean and dirty thread sized has the starch carefully figured out. Taking the total of these figures we have 20.06 per cent. which must be the amount of waste that Manager is making in his mill today if he still makes the 10.71 per cent. picker waste that he made in 1878.

These figures, exclusive of the 10.71, are the results of my experience, and I would like to have Manager comment on them.

TRAINING SKILLED HELP.

BY F. S. T.

The following are the conditions that actually exist in a spinning room in one of the best mills in one of our Northern States, and they may be of interest to some of your readers. The number of spindles in the mill is about 35,000, of which about 18,000 are used for spinning 36s filling on 1⅜ inch rings and 6 inch traverse. About 17,000 spindles are used for spinning 30s warp yarn on 1¾ inch rings and 6¼ inch traverse. Spinners tend from six to eight sides of 112 spindles each, either warp or filling, doing their own cleaning and oiling of rolls. The front roller speed is 120 R. P. M.

The weekly production (56 hours) of these spindles is about 42,000 pounds of yarn with between 500 and 600 pounds of underclearer waste a week. The total number of regular hands on the ring spinning pay roll is 100. These are divided into the following nationalities: Native Americans, 3; English, 1; Polanders, 12; Portuguese, 23; Italians, 15; French, 46. About 90 per cent. of this help live in the company's tenements, but through moving, changing of employment, etc., there is a small stream of new help constantly entering and leaving. Many of these are hands who have just arrived at the legal age of employment and have received their employment certificates, the management being very strict about this.

Now the chances are that in nine cases out of ten, these learners must be placed with skilled hands speaking their native tongue, and upon them with such assistance as the second hand and section hands may be able to give, rests the responsibility of the learner's technical education. Some hands are very good about this and take great pains to teach the learner right. Others are very indifferent claiming that it makes their work harder by devoting time to a learner that they might use to their own advantage; and undoubtedly it does.

The rule is, to pay these hands who take an interest in learners, extra money for their trouble, thus giving them an incentive to teach new help and making it assured that they are taught right. The learner becomes a skilled hand quicker, the discipline is kept up, and a large percentage of inferior work is eliminated and the management finds that it pays, and that with few exceptions they make permanent hands. The management also finds that a large percentage of help seeking employment from other mills can not, or do not, handle their work as he desires it to be handled, thus entailing extra care and watchfulness until the new hand meets the mill standard or drifts out to seek employment elsewhere.

If every mill would take the same pains as this mill does to teach new help rightly, no matter how many different nationalities we may employ, we would no longer hear the wail that goes up from many mills that "they can not get skilled help," that "the quality of help is deteriorating," that "it is not what it used to be," that "their product is suffering."

Too many mills desire to profit at the other fellow's expense; they can see no farther than the end of their nose, but they are the losers in the end, because help like to work where an interest is shown in their welfare, where discipline is enforced; and discipline means neatness. A neat room and slack help can never go together. Demand neatness in the room, and the help will measure up to it accordingly in personal appearance and otherwise. No matter what nationality the help there is a pride among them and the desire to rise, to better their conditions, to have things; and it pays in the long run to foster it.

And back of it all our superintendents and overseers must be men; men of minds large enough to be free from prejudice against any nationality; to see there only the brotherhood of man, the opportunity to uplift a fellow creature, the opportunity to make better workers and therefore better citizens. Then instead of having our mills looked down upon as employing only the low and ignorant we can make them compare favorably with any other line of employment, and a desirable place for any young woman or man to enter, who desires to earn money to fulfill some ambition in life.

We must admit that too many overseers are hired without any inquiries being made as to character, the only requisite being the ability to produce the goods; and we must also admit that while some of these overseers are able to produce the goods they have a demoralizing influence upon the help, certain things regarding their character creep out and have a tendency to prevent self respecting help from entering their employ, and the mill consequently suffers. With the right management, superintendent and overseers no matter what nationality the help is, that mill will be a success and a power for good in the community.

ONE CAUSE OF CUT ROVING.

BY G. B. M.

It is the intention of the writer to tell a few things that do not seem to be generally known or else they are so well known that no one undertakes to write about them. In regard to cut yarn I am going to tell of a proposition that I had to deal with about five years ago in one of the large mills in northern Alabama. The position I held was that of second hand in the card room. The boss carder was an experienced man, the author of a book on carding, and a man of wide reputation. And notwithstanding the fact that I, myself, was a graduate of carding and spinning and backed by about 20 years of practical experience, we were both foolish enough to get ourselves into quite a lot of trouble—at least the boss carder told me to make a change in the gears a certain way and I thought it was all right.

We were making 4.35 hank roving and the work was a little too light; and the spinner kept complaining about the work being too light. Now when we started in to make the change we discovered that we only had half enough gears to go around on all the frames. The frames were

3½ x 7 inch frames and contained 168 spindles each, and were geared up on both ends of the frame. So the boss carder instructed me to cut one end out and run the frame from the gears on the other end which was done.

In a few days the weight of the yarn was heavy enough, but instead of running better it seemed to run worse, and a few days later some one discovered that the yarn was cutting badly. The machines in the card room were examined very carefully, but nothing was found that looked like it was cutting the roving, so the carder told the spinner the trouble was in his own room. This state of affairs went on for a month or two, when the manager decided to take a hand. He looked over both the card and spinning rooms, but could find nothing wrong, so he decided to submit the matter to an expert.

The expert came and made a very exhaustive examination of everything in the card room but failed to place the blame there. He finally told the spinner that his spindles were speeded up too high, and the manager spent about $1,000 for new pulleys, etc. This ended the expert's work, but the trouble was not remedied.

Now in spite of the fact that the mill was turning out cut roving and it seemed that nobody was able to locate the cause, we had a splendid system of tracing bad work. One day I had an intermediate draft gear to break on one of the intermediate fly frames. This is the gear that transmits the power from the back roll to the middle roll, and the frames had one of these at each end of the frame, so I decided that I would take out the broken one and run the frame with the gear at the other end until I could have one made. The frame started up and seemed to run just as satisfactorily with one gear as it had been doing with two.

And thus things went along very smoothly until the roving made on this intermediate was set in on the speeders; then the trouble began. When this roving began to come through the speeders it showed the imperfections clearly. It did not take me long to learn that the trouble was with that intermediate mentioned above, so I examined it pretty closely and found that on the end of the frame where there was no gear that the middle roll was trembling or turning in jerks, due to the torsion of the long roll—and, of course, a discovery was made. I then proceeded at once to have gears cut, and geared up both ends of all the speeders and the intermediate in question, and the trouble disappeared.

Now the lesson from this experience is this: That if either the draft gear, crown gear or intermediate draft gear on one end of the frame is out of gear and the whole roll is being driven by the gears at the other end of the frame —the torsion of the roll will allow the end that is out of gear to run with a slight tremble or jerk which slightly cuts the roving at a uniform distance of about ⅛ to ¼ inch apart, and the cut is so slight that it does not materially affect the running of the work on that process, nor can it be very easily detected in the roving. However, when it gets to the next process and the rolls begin to draft it out, the cut places give more readily than the other parts of the roving and thick and thin places are the result.

Trouble like the above can be very readily detected by putting the hand under the steel rolls and feeling them while they are running. If they are trembling, there is something wrong with the gears and if it is not remedied, cut roving will be the result.

COP TROUBLES ON A MULE.

BY W. E. W.

The quadrant plays a very important part in the operation of a mule, and is the source of a great deal of cop trouble. However, I will not try to discuss this mechanism completely, but will only give the details about the builder motion itself. This is a part that is very hard for most men to understand. We will say that a mule is making a cop with a short chase on the tube, and it becomes longer until the cop is full. Suppose we want to make the chase longer on the tube without making it become too long when the cop is full.

This can be obtained by letting what is known as the back builder box in England, but what is well known in this country as the back shoe, back towards the rear of mule just a little, and letting the long rail down a little by a screw on the front of the same. In other words the boxes or shoes are put close together. In making this change, it will be necessary to lengthen the boot leg out just a little so as to make the yarn wind as low on the tubes as before the change. However, it will not change the shape of the cops. As there is no hard and fast rule that can be laid down for such a change, I will not undertake to give the exact settings for the builder motion.

There is another cause that will make cops get out of shape in that way on old mules and that is for the back shoe to be worn more than the front. When one is found to be worn it will have to be filed before the desired results can be obtained and no one but an expert should be allowed to file them. The back shoe must be filed most at the back or high part and come out to no filing at the low part. That will make the long rail fall slower at the back and therefore make the chase become right. If the chase is too long at the start and becomes shorter as the cop builds then file the shoe in a contrary manner from that just explained.

Take a cop with a round bottom which is almost always short, and you will find that the coning parts of the shoes are worn flat or have been filed by someone who did not know how it should be done. Therefore it must be filed again to be put into proper shape. In filing leave the highest part at the back and coming down the coning part, take off more as you get down toward the point where the shoulder is turned. It is necessary, however, to use good judgment and not take off too much, but make the bottom become longer and straight without changing anything else. Cops with a hollow bottom are caused by having the coning parts of the shoes too high at the start and finish, in other words having the coning shoe hollowed out in the middle.

Cops that are larger at the shoulder and finish are caused by the shoes having a low place between the coning parts and finish, which means that some filing is necessary to remedy it, because shoes must be straight between the coning parts and the lowest point. Of course if a cop is larger in the middle it shows that the shoes must have a high place between the coning parts and the lowest point. A cop made with a hollow cone is produced by the long rail having a high place on it or sometimes by the short incline on the front being too high, which is caused by the internal builder shoe being set too far towards the front.

A cop with a round cone can almost always be traced to the quadrant being set too far front; or where bands are used the long band being too slack. Ridged cops are made from many causes such as the long rail being worn so as to have lumps on it caused by the pulley binding in its bearings and slipping over the rail in place of rolling.

A worn pulley will cause ridged cops. Flat places on the stud on which boot leg runs are very bad, because they not only make ridged cops, but also make it impossible to prevent cut yarn on the cops. This is due to the fact that the boot leg will almost always lock up on the low places, and when the spinner runs his ends to suit the low places the boot leg locks upon one of these high places making it impossible to keep the mule from cutting the yarn. Ridged cops have also been traced to the quadrant pinion not being set deep enough.

A bad cop nose is made from many causes such as fallers binding or not being in line, the quadrant not being set right, the depressing lever acting too soon or not soon enough, the mule being out of line, etc., the screw plates at the spiders being loose will make bad cops at that particular place, also the weight levers running on the floor when the mule is winding.

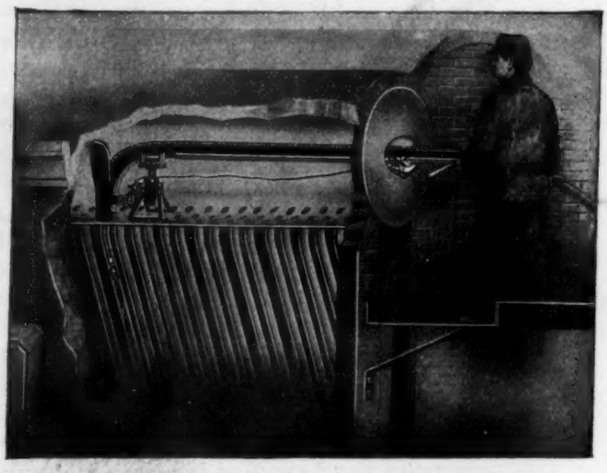
There are many other causes of the trouble that I have mentioned, and there are some men who do not believe in filing a builder at all. Of course that's a good theory. But when it becomes necessary on mules that have been running for years then it must be done before you can get good straight cops.

NEW MACHINERY AND TRADE NOTES.

NEW DEVICE FOR CLEANING STIRLING BOILERS.

In removing the scale from the tubes of Stirling boilers it has been necessary to have a man crawl into the drum, sit cramped up in an awkward position and run a turbine cleaner through each tube. It was also necessary to have a helper on the outside to turn the water or steam on or off.

All this trouble and inefficiency in cleaning this type of boiler has been rendered unnecessary by a new device recently perfected by the Lagonda Mfg. Co., of Springfield, Ohio. The accompanying illustration shows how this device is applied and used. The man stands outside of the boiler in a working position where he can regulate the steam or water supply himself, thus doing away with the extra wages and time of an assistant. The device consists of a sectional trough arrangement having a funnel at the far end for guiding the turbine into the tube. The trough is supported on the edge of the manhole at one end, and by a special tripod over the tubes at the other end. This tripod can be easily moved around at will, thus allowing the cleaner to be shifted from one tube to another. The operator places the funnel over any tube he wishes to clean and starts to feed the cleaner in, the rate of feeding being determined by the amount and character of the scale. In feeding in the cleaner the operator is guided entirely by the ear and touch, but he would have to be guided this way in any event, even if he were on the inside, as on account of the curvature it is impossible to see through Stirling boiler tubes.



METHOD OF USING THE LAGONDA MFG. CO.'S TUBE CLEANER.

After cleaning one tube the tripod is shifted to the next one and the cleaner fed in as before. It should be noted that when the supply hose is filled with water it becomes rigid enough to force the cleaner at any desired rate. As a trough arrangement is made up of short lengths which snap together, the device can be used in very cramped quarters. There are no obstructions or guides on top of the trough, and the cleaner and hose can any time be withdrawn from the drum, and the cutter wheels renewed or the turbine inspected. It has been found that by using this device the time consumed in cleaning Stirling boilers is greatly reduced and the cost of a helper is eliminated. It also insures a first-class job to the owner. Further information concerning this device can be obtained from the Lagonda Mfg. Co., Springfield, Ohio.

DETERIORATION AND DECAY OF FIBERS AND FIBROUS STRUCTURES.

BY DR. ARTHUR L. DEAN.

All vegetable structures, from the giant trees of California to the smallest seed are composed of masses of cells of various shapes and sizes joined together to form the multitude of various plants and plant parts. There are certain plants which owe their economic value to the fact that some of their constituent cells are long and relatively slender, forming what we call fibers. The valuable fibers are usually formed in what botanists call the fibro vascular bundles of plants, that is, the fibrous parts constituting the strength giving portions and also containing the elements through which water and food materials circulate. There is one very striking exception—cotton—which is a seed hair.

Vegetable fibers are commonly said to consist of cellulose, and cellulose is best defined as the material of the plant skeleton. A few places in nature there is found a cellulose of such well defined chemical nature, so resistant to all destructive agencies, and so representative of all the valuable economic properties we associate with the cellulose, that this substance has been called "normal" cellulose. This most valuable member of the group is really rare in

nature accruing in but a few plants of which cotton, flax, and ramie are perhaps the best known. The differences between these fibers are structural, not chemical.

One of the most plentiful and useful cellulose is the so-called ligno-cellulose—wood cellulose—which makes up nearly all the material of woody structures, and, one well known textile fiber, jute, is composed of ligno-cellulose. Despite the small part that ligno-cellulose plays in the textile industries, it is very important in that it is the material of which wood is chiefly composed and in spite of modern concrete and steel, wood is still of the very greatest importance in our industrial life.

All materials composed of vegetable fibers are liable to deterioration, and the causes of such deterioration and the measures of preventive are worthy of serious study.

In the manufacture of cotton goods there are numerous opportunities for injuring the cellulose of the cotton so that its life will be short. Proper care and supervision need to be exercised in bleaching, dyeing, and finishing that the chemicals are not allowed to seriously attack the fiber. Cases are not unknown where new cotton cloth laid away for several years has been found absolutely worthless, probably due to the formation of cellulose by traces of chemicals left in the goods. Some of the finishing compounds are fearfully and wonderfully made, and since they are destined to stay in the fabric until it is washed, too great care can not be exercised by conscientious manufacturers that they contain nothing which will slowly attack the cellulose of the cotton fibers.

BOARD TAKEN FROM A FLOOR TREATED WITH AVENARIUS CARBOLINEUM, PERFECTLY SOUND UNDER TRYING CONDITIONS FOR 19 YEARS, IN A HOUSE WHERE THE WOOD WAS SUBJECT TO MILDEW AND DRY ROT.

When we come to consider the fibrous structure of wood, the history of deterioration is quite different. Here mechanical causes and improper chemical treatments are the exception—decay is the rule. What then is decay? The decay of wood is not a spontaneous breaking down of the woody tissue, but it is a disease caused by the life and growth of certain of the lower forms of plant life. These destructive agents belong to the group of the fungi, that is, the plants with no green coloring matter. All fungi must derive their nourishment from the dead or living material of other plants or animals, and they accomplish this in all sorts of different ways. The wood destroying fungi take their sustenance from the wood; some when it is in the living tree, others only from the cut timber and dead trees, and still others from both living and dead. At first the wood shows no evidence of the attack, although the insidious fungi may be at work deep inside, and unnoticed are dissolving the film walls. Gradually the wood gets lighter and softer until finally it crumbles to a structureless and useless mass. Under favorable conditions the fungi produce their fruiting organs, toad stools, or shelf like growths, which bear on the gills or pores of the under surface thousands of minute spores, visible only with the aid of a powerful microscope, which serve as seeds to be wafted by the merest breadth of air, finding lodgment in cracks and crevices, ready to germinate and start a fresh attack.

The problem of how to stop this decay has occupied the attention of many able men. We know now pretty well the lines which must be followed if we are to prevent the rapid destruction of wooden structures. To grow and carry out their harmful action these fungi must have air, moisture, warmth, and food supply. Deep under water or earth where there is no adequate air supply there is no decay; where moisture can not reach there is no decay; in the frozen regions wood does not decay; but where there is wood there is food supply, and let the other conditions be favorable, the result is certain unless preservative measures be taken.

Preservation may be effected where we can exclude air or moisture. The former is rarely possible, but the removal of the natural water in wood is possible and in many cases the wood can be kept dry thereafter. Proper seasoning is then the first step in preservative treatments. But where the wood must be in more or less damp locations, as it must in many places around mills, railroads, bridges, fences, etc., this seasoning must be followed by the use of some antiseptic which will prevent the growth of the fungi by acting as a poison to them.

Various preservative agents have been tried, but from all the accumulated mass of data on wood preservation, this one fact stands as unquestionably true: *Wood properly treated with the heavy oils distilled from coal tar will not decay.* Experience has further shown that it is the heavy, high boiling portion of the coal tar distillate, known as anthracene oil, that stays in the wood indefinitely and is the effective preservative agent. Such an anthracene oil, chemically treated with chlorine, has been successfully used as a wood preservative since Dr. Richard Avenarius of Germany was the discoverer and patentee of this remarkable preservative, known as Avenarius Carbolineum. This we all know is a safe and sure thing to use, since it has stood the test of time, the final supreme test applied to all wood preservatives.

This preservative may be applied in a variety of ways, by the brush, with a spraying machine, by dipping the wood

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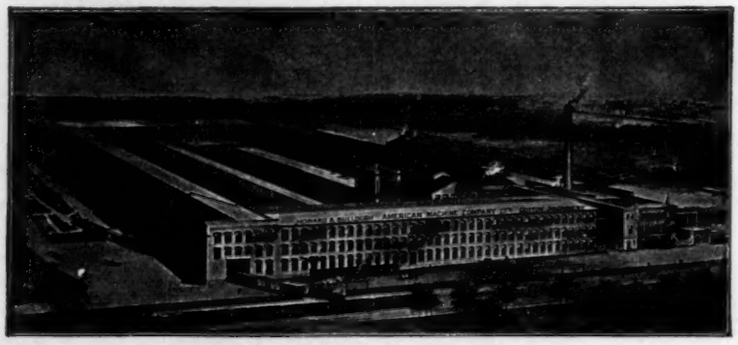

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WE INVITE YOUR INVESTIGATION AND COMPARISON

in the hot oil, or by treatment in hot and cold oil. Full and reliable details on all these points may be had by writing the Carbolineum Wood Preserving Co., 186 Franklin St., New York City. This company will be glad to give unbiased advice to any of the readers of COTTON regarding the best methods of preserving the wooden structures which they may have, or where questions arise as to the practicability of using this preservative on wooden tanks or on woodwork of any kind coming in contact with acids, bleaches or chemical solutions.

SEYDEL MFG. CO., Jersey City, N. J., manufacturers of sizings, finishings, soaps and softeners, are sending out a very attractive pamphlet on their well-known Sizol compounds. It is stated in the pamphlet that these sizol compounds contain sizol gum to strengthen the yarn, fatty matters to soften and lay the fiber, and chemicals to condition and preserve the sized yarn. Some of the sizol brands are, "Sizol A," for light sizing on plain looms; "Sizol L," for light and medium sizings on automatic looms; "Sizol C," for heavy and medium sizings on plain and automatic looms; "Sizol S," for heavy and stiff sizings and finishings.

AMERICAN MOISTENING CO., Boston, Mass., has recently received orders for humidifiers from the following concerns: Arcade Cotton Mills, Rock Hill, S. C.; Fitzgerald Cotton Mills, Fitzgerald, Ga.; Calumet Mfg. Co., Liberty, S. C.; Pacific Mills, Lawrence, Mass.; Merchants Mfg. Co., Fall River, Mass.; Neild Mfg. Corporation, New Bedford, Mass.; International Cotton Mills Corporation; Lafayette Worsted Co., Woonsocket, R. I., and Cleveland Worsted Mills, Cleveland, Ohio.

DRAPER CO., Hopedale, Mass., in its October issue of *"Cotton Chats,"* would seem to show conclusively that "The Tide has Turned in Cotton Manufacturing" by the publication of a list of 21 mills ordering 6,673 Northrop Looms within the past eleven weeks. The issue also contains a very interesting note relative to hand spinning and weaving which is practiced within 20 miles of Knoxville, Tenn., today. A very concise and clear-cut discussion is given on "Alterations, Improvements, Inventions and Patents" which every mechanically inclined cotton mill man should read.

THE C. J. ROOT CO., Bristol, Conn., manufacturers of counters and measuring devices for cotton cloth, etc., has just issued an interesting booklet on its "Counting Machines" which includes the "Bristol," "Elm City," and "Ro-co" counters. Each one of the counters is fully described and illustrated, and the prices of the different sizes tabulated. A copy of this interesting booklet may be had by addressing the company.

AMERICAN CARBON & BATTERY CO., East St. Louis, Ill., has recently purchased the Doe Battery & Mfg. Co., of Kent, Ohio, including the plant, business and good will of that company. The American Carbon & Battery Co. will continue to manufacture dry cells under their name in connection with the manufacture of carbon and graphite products. The company is in a very favorable position to manufacture dry cells by reason of its close identification in dry battery work during the past ten years. Its experience in manufacturing carbon elements for various dry cell manufacturers has given the company the closest insight

into this work, and has enabled it to make many improvements of the "Victor" cells as marketed by its predecessor. The cells now made are known as No. 6 American Dry Cells, No. 6 American Special Ignition Dry Cells, and No. 8 American Dry Cells. The company is just issuing some descriptive literature on American dry cells that is of special value to users. Copies may be obtained by addressing the company in East St. Louis, Ill.

There are still some manufacturers who use tallow as a softener. They ought to make a trial once of the Soluble Softening Oil, made by the ARABOL MFG. CO., 100 William St., New York. It is stated that it gives a smooth finish of the warps, easy parting of the threads in the lease rods, clean and bright appearance of the slasher cylinders. Especially fine results are said to be obtained with close woven goods, such as corduroys, velveteens, sateens, umbrella cloths, cambrics, etc. The seasons have no influence on Soluble Softening Oil, it remains sweet, uniform and pliable summer and winter. It is neutral and easily blended.

DETROIT GRAPHITE CO., paint makers, Detroit, Mich., has issued an attractive booklet giving some interesting information relative to its "Superior Graphite Paint," including its manufacture and uses. Many well-known structures, for which the paint has been furnished, are illustrated. Copies of this catalog may be obtained upon request.

FALL RIVER: Charleston Mills have just awarded the contract to The Westinghouse Electric & Manufacturing Co. for one 750 KVA., 600-volt, 3-phase, 60-cycle, 2-pole, 3600 R. P. M., turbo-generator set. The low pressure turbine will be equipped with a No. 11 Westinghouse-LeBlanc turbine driven condenser. The generator fields will be magnetized by means of a 50 K. W., 125-volt, D. C. turbo-generator exciter set. The same order includes one 300 KVA. 3-phase, 600-volt, 60-cycle, 514 R. P. M., A. C. 3-bearing, belted generator, one 25 K. W., 125-volt, 1150 R. P. M., 3-phase, 60-cycle A. C. motor generator set and one 4-panel switchboard.

HUNGERFORD & TERRY, Inc., 1414 Pennsylvania Bldg., Philadelphia, Pa., manufacturers of water filters, have appointed H. G. Mayer, Southern agent for the sale of their water filters and water softeners. Mr. Mayer, who is also the agent for a number of textile machinery firms in the South, is located at Charlotte, N. C., with offices in the Realty Bldg.

Hungerford & Terry, Inc., report a number of recent installations in the South, among which are plants at the Camperdown Mills, Greenville, S. C., Bedford Pulp & Paper Co., Lynchburg, Va., DeWitt-Wharton Mfg. Co., Lynchburg, Va., Dan River Power & Mfg. Co., Danville, Va., Revolution Cotton Mills, Greensboro, N. C., Durham Hosiery Mills, Durham, N. C., Cliffside Mills, Cliffside, N. C., and the Cedartown Knitting Co., Cedartown, Ga.

CORLEY TEXTILE SPECIALTY CO. has opened offices in the Empire Building, Atlanta, Ga., and will manufacture and put upon the market the Corley-Williams Automatic Thread Guide for cone winders, which was described and illustrated in a previous issue of COTTON. The concern will manufacture several other devices which are to be brought out later.

The company is capitalized at $20,000, and was organized with a view to acting as manufacturers' agents in the Southern territory for textile machinery and specialties, and the concern believes that it is in a position to offer to the Northern and foreign manufacturer facilities that cannot be excelled. The managing personnel are men of ability and experience in their special lines, the president and manager being a graduate engineer and a thoroughly practical mill man as well. It is the purpose of the company to put on the road the highest class of specialty salesmen, and to spare no pains or money to build up the strongest and most aggressive agency in the South. The company is open to consider propositions from reputable concerns, and state that negotiations are already pending with several prominent manufacturers. The company expects to make further announcements of interest to the trade in the near future.

CARBOLINEUM WOOD PRESERVING CO., 182 Franklin St., New York, N. Y., has just issued a bulletin No. 33 dealing with farm and home uses of Avenarius Carbolineum Wood Preservative. This bulletin gives a method for treating farm fence posts; and other valuable information is also contained in its pages. A number of testimonials are given to show the satisfactory results obtained by the use of this wood preservative. A copy of this bulletin may be had by addressing the New York office of the company.

NIAGARA ALKALI CO., Niagara Falls, N. Y., advises that the new plant to take the place of the old Roberts Chemical Co., is nearly completed and will be in operation by January 1st. In the manufacture of caustic potash, caustic soda and chlorine gas, the company utilizes the Biliter Cell, as developed in Aschersleben, Germany and Bruckl, Austria. This is claimed to be the best cell ever devised, being of a simple horizontal diaphragm construction, operating by percolation, doing away with the necessity of having a circulating brine system. The cathode liquor comes off at a fairly high concentration—about 18 per cent.—and no oil or other inflammable materials is used in connection with the cell. The cost of the cell is low and the current efficiency operating commercially about 97 per cent.

From the chlorine gas, muriatic acid is manufactured under the old Roberts patent owned by the company, producing the only muriatic acid free from sulphur and arsenic. The company also liquefies a portion of the chlorine gas. This branch of the business is handled by the Electro Bleaching Gas Co., 24 East 21st St., N. Y. City. Niagara Alkali Co. is also arranging to engage in the manufacture of tin chloride, carbon tetrachloride, potassium chlorate and bleaching powder. Another branch of the business will be the manufacture of acetylene tetrachloride, chlorides and oxychlorides of metaloids, zinc chloride.

The Biliter cell operates at 300 amperes pounds and about 3¾ volts, and the production per 24 hours equals 330 pounds of solid 90 per cent. KOH per cell.

PROVIDENCE ENGINEERING WORKS, Providence, R. I., manufacturers of Rice & Sargent Corliss Engines, have just issued a very handsome bulletin describing their standard heavy duty Corliss engines, and giving details of construction and pertinent data, floor space, horse power ratings, etc. The bulletin is profusely illustrated with different styles of Rice & Sargent Corliss engines, and the descriptions of the different parts of the engines are illustrated

THIS ISSUE 6,750 COPIES.

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THE TIDE HAS TURNED

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This is shown by the fact that in the eleven weeks ending November tenth we received orders for

6673 NORTHROP LOOMS

About five-sixths of these are to replace old looms. About two-thirds are in the North and one-third in the South. Nearly all are repeat orders.

They include looms for weaving wide and narrow sheetings, drills, denims, tickings, chambrays, seamless bags, pillow tubings, corduroys, jeans, ginghams, light ducks, fancy goods, etc.

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